3 00

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER

TM 11-2084

TO 31W2-2FTC-1071

TELEPHONE SWITCHBOARDS SB-55/FTC AND SB-55A/FTC (FIRE REPORTING)

DEPARTMENTS OF THE ARMY AND THE AIR FORCE

MARCH 1958

This manual contains copyrighted material

*TM 11-2084
TO 31W2-2FTC-1071

TECHNICAL MANUAL
No. 11-2084
TECHNICAL ORDER
No. 31W2-2FTC-1071

DEPARTMENTS OF THE ARMY
AND THE AIR FORCE
WASHINGTON 25, D. C., *14 March 1958*

TELEPHONE SWITCHBOARDS SB-55/FTC AND SB-55A/FTC (FIRE REPORTING)

		Paragraphs	Page
CHAPTER 1.	INTRODUCTION		
Section I.	General	1, 2	3
II.	Description and data	3-8	3
CHAPTER 2.	INSTALLATION		
Section I.	Service upon receipt of equipment	9-15	6
II.	Connections	16-21	10
III.	Preoperational procedures	22-24	12
CHAPTER 3.	OPERATING INSTRUCTIONS	25-27	14
4.	ORGANIZATIONAL MAINTENANCE INSTRUCTIONS		
Section I.	Switchboard operator's maintenance	28-31	18
II.	Organizational maintenance procedures	32-35	20
III.	Troubleshooting	36-39	23
IV.	Repair and adjustment of relays and switches	40-45	26
V.	Removal and replacement of parts	46-49	29
CHAPTER 5.	THEORY	50-56	33
6.	FIELD AND DEPOT MAINTENANCE	57-64	37
7.	SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE		
Section I.	Shipment and limited storage	65, 66	40
II.	Demolition of equipment to prevent enemy use	67, 68	41
APPENDIX	REFERENCES		42
INDEX			43

*This manual supersedes TM 11-2084, 29 November 1949.

AGO 4784A—Mar

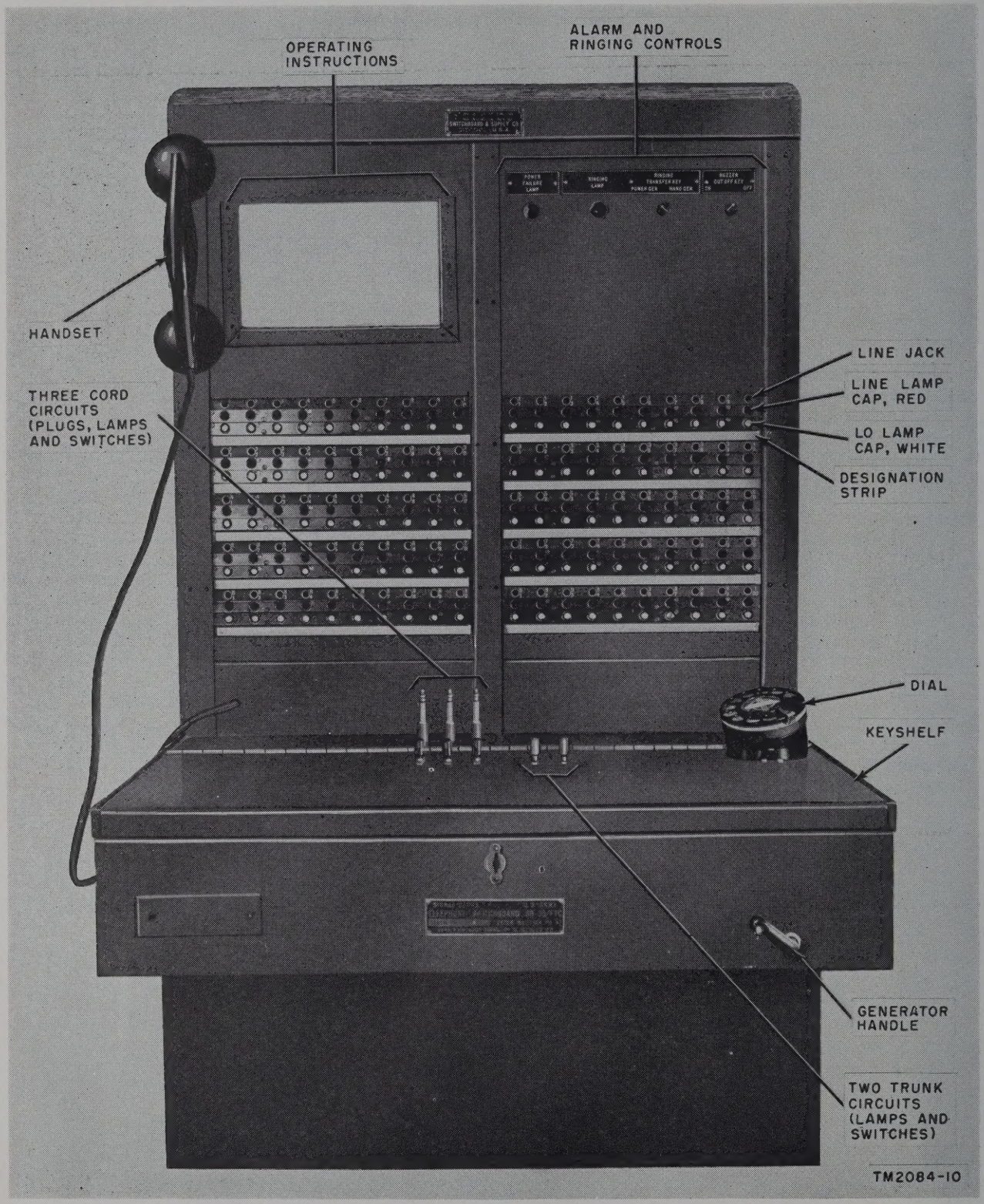


Figure 1. Telephone Switchboard SB–55/FTC.

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual covers the installation, operation, and maintenance of Telephone Switchboards SB–55/FTC and SB–55A/FTC (Fire Reporting).

b. The appendix contains a list of applicable publications.

c. Official nomenclature followed by (*) is used to indicate all models of the equipment item discussed in this manual. Thus Telephone Switchboard SB–55(*)/FTC is used to indicate Telephone Switchboards SB–55/FTC and SB–55A/FTC.

2. Forms and Records

a. Unsatisfactory Equipment Reports.

(1) Fill out and forward DA Form 468 (Unsatisfactory Equipment Report) to Commanding Officer, U. S. Army Signal Equipment Support Agency, Fort Monmouth, New Jersey as prescribed in AR 700–38.

(2) Fill out and forward AFTO Form 29 (Unsatisfactory Report) to Commander, Air Materiel Command, Wright-Patterson Air Force Base, Ohio, as prescribed in AFTO 00–35D–54.

b. Report of Damaged or Improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700–58 (Army); Navy Shipping Guide, Article 1850–4 (Navy); and AFR 71–4 (Air Force).

c. Preventive Maintenance Forms (figs. 11 and 12). Prepare DA Form 11–242 (Maintenance Check List for Signal Equipment (Manual Telephone and Telegraph Central Office Set)) in accordance with instructions on page 1 of the form.

d. Comments. Forward all comments on this publication directly to Commanding Officer, U. S. Army Signal Publications Agency, Fort Monmouth, N. J.

Section II. DESCRIPTION AND DATA

3. Purpose and Use

a. Telephone Switchboard SB–55(*)/FTC (fig. 1) is a single position, common battery, manually operated switchboard. It is used in a permanent fire department headquarters and has terminating facilities for 100 fire reporting station lines. Two trunks are provided for connection to the main telephone system.

b. The circuits of the SB–55(*)/FTC are arranged for two-way communication between the switchboard operator and the fire reporting telephones or the main telephone system. There are no facilities for interconnection of lines or trunks.

c. When connected to the additional equipment required (par. 7), the SB–55(*)/FTC becomes the major component in a fire reporting telephone system (fig. 2).

4. Technical Characteristics

Lines served	100.
Trunks served	2.
Cords supplied	3.
Type of operation	Common battery.
Signals:	
Incoming line	Red lamp and bell.
Line out of order	White lamp and buzzer.
Incoming trunk	Green lamp and bell.
Power requirements	110 v ac and 48 vdc.
Operating battery voltage limits.	44 to 52 vdc[1].
Ringing	20 cps ac at 70 to 90 v.
Line loop resistance including variable resistor at station.	3,800 ohms.
Line minimum insulation resistance.	20,000 ohms.
Trunk loop resistance	Determined by the working limits of the connecting office.
Trunk minimum insulation resistance.	20,000 ohms.
Dial speed	8 to 12 pulses per second.

[1] Voltages within which properly adjusted relays function efficiently.

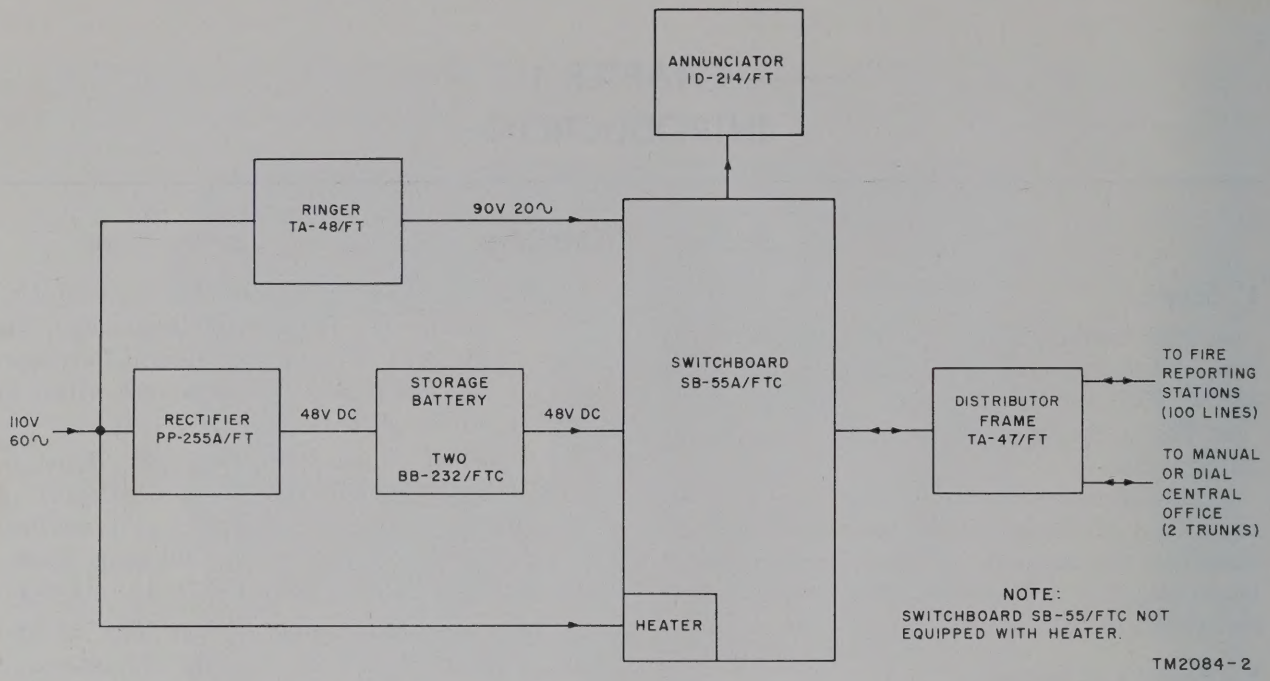


Figure 2. Typical fire reporting system, block diagram.

5. Components of Telephone Switchboard SB–55(*)/FTC

a. The major component is the switchboard positional unit. It is 57½ inches high, 38¼ inches deep, 24 inches wide, and weighs 475 pounds. It is wired and equipped with the following circuits:

100 fire reporting line circuits
2 trunk circuits (manual or dial)
3 cord circuits (single-ended)
1 operator's circuit w handset
1 night alarm circuit
1 line-out alarm circuit
1 ringing and ringing failure alarm circuit
1 power failure alarm circuit
1 heater circuit (SB–55A/FTC only)

b. The minor components are as follows:

20 open link fuses (2 amperes)
209 slide base lamps, 48 volts direct current (dc)
1 screw base lamp, 120 volts alternating current (ac)
1 electron tube, JAN type 359A.
103 white lamp caps (.370 inch diameter)
103 red lamp caps (.370 inch diameter)
2 green lamp caps (.370 inch diameter)
1 white lamp cap (.703 inch diameter)
1 amber lamp cap (.703 inch diameter)
1 key for keyshelf lock
1 canvas tool roll containing special hand tools (par. 34)
2 technical manuals (TM 11–2084)

c. The running spares supplied with the equipment are as follows:

4 open link fuses.
1 electron tube, JAN type 359A.
20 slide base lamps, 48 volts dc
1 screw base lamp, 120 volts ac

Note. Additional equipment required for the installation and operation of Telephone Switchboard SB–55(*)/FTC is covered in pargraph 7.

6. Description of Telephone Switchboard SB–55(*)/FTC

(fig. 1)

The switchboard consists of a jackfield (face equipment), keyshelf, circuit components, and terminal boards for connecting cables, all mounted in a wooden cabinet. The rear cover is removable. Most circuit components (relays, resistors, coils, etc.), are gate-mounted in the rear of the cabinet.

a. The face equipment accommodates 100 station lines. Each station has two lamps and a jack. The line lamp (red), when lighted, indicates an incoming call reporting a fire. The LO (line out) lamp (white), when lighted, indicates trouble on the line. This line-out feature, exclusive to fire reporting lines, assures the reli-

ability of outside plant. Also included in the face equipment are two alarm lamps, two switches, a card containing operating instructions, and a cord which connects to the handset.

b. The keyshelf includes three single-ended cords with associated switches and lamps used by the operator to answer calls from the station lines. A dial and two trunk circuit switches with associated lamps are also located on the keyshelf. The two trunk circuits (from dial or manual central offices) do not appear in the face equipment and are engaged by the operator when the associated trunk switch is operated. The crank handle of the emergency generator extends through the keyshelf apron.

7. Additional Equipment Required

Equipment required for operation, but not supplied as part of the SB–55(*)/FTC, is summarized in the following chart and explained below:

Quantity	Item
Up to 100	Telephone TA–105/FTC (modified *b* below).
2	Battery BB–232/FTC.
1	Rectifier Battery Charger PP–255A/FT.
1	Annunciator ID–214/FT.
1	Distributor Frame TA–47/FT or equal (distributing frame).
1	Ringer TA–48/FT or equal.
1	Annunciator switch (single-pole, double-throw, nonlocking, push-type switch).
As required	Cable and wire for interconnecting equipment to provide a fire reporting telephone system.

a. Annunciator ID–214/FT. The SB–55(*)/FTC is used in conjunction with Annunciator ID–214/FT, which is a wall-mounted lamp panel. An incoming signal to the switchboard from any fire reporting station lights the correspondingly numbered lamp cell in the annunciator. The annunciator signal must be released by the switchboard operator. For further details, refer to TB SIG 218.

b. Telephone TA–105/FTC. Telephone TA–105/FTC, modified to include a 4,500-ohm Ohmite variable resistor (Sig C stock No. 326450–2 or equal) connected across terminals L1 and L2, is used as station equipment. During installation, the variable resistor is adjusted to provide a total line loop resistance of 3,800 ohms. This is necessary for efficient operation of the line-out alarm circuit. For detailed information, refer to TM 11–468.

c. Battery BB–232/FTC. Battery BB–232/FTC is a 24-volt storage battery. Two are required (connected in series) to provide the 48 volts dc for transmission and signaling. The battery will carry the switchboard load for several hours in the event of an ac power failure. For detailed information, refer to TM 9–2857.

d. Rectifier Battery Charger PP–255A/FT. The rectifier normally provides the 48 volts for operation and keeps the battery fully charged and floating in the line. For detailed information, refer to TM 11–2536.

e. Distributor Frame TA–47/FT. The frame terminates incoming lines and provides flexibility through cross connections between outside and inside plant.

f. Ringer TA–48/FT. The ringer converts 110 volts, 60 cycles per second (cps) to 90 volts, 20 cps which is required for the alarm buzzer and for the operator to signal distant stations. For additional information refer to TM 11–487B.

g. Push-Type Switch. The switch (par. 14) is required for the operator to release the annunicator signals. It must be installed in the face of the switchboard.

8. Differences in Models

Telephone Switchboard SB–55/FTC and SB–55A/FTC are similar except that the SB–55A/FTC includes a heater circuit. A controlling switch for the heater circuit is mounted above the jacks in the right-hand panel of the face equipment.

CHAPTER 2
INSTALLATION

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

9. Siting

Telephone Switchboard SB–55(*)/FTC is designed for permanent installation in a well-constructed building. The floor must be level and strong enough to support the equipment without vibration from normal traffic. Do not unpack the equipment until the building is completely ready and the location for the switchboard has been marked on the floor. Tools and materials required for installation are the same as those required for maintenance (pars. 33 and 34).

10. Unpacking

a. Packaging Data. When packed for shipment, the switchboard is placed in a moisture-vaporproof container and packed in a wooden box. The box is 66 inches high, 42 inches deep, and 30 inches wide. It weighs 823 pounds. The minor components (par. 5*b*) are wrapped in corrugated fiberboard and secured within the switchboard. An exploded view of the switchboard packed for export is shown in figure 3.

b. Removing Contents. Locate the packing box as close as possible to the operating position of the switchboard and unpack the unit as outlined below.

(1) Place the packing case with the skids resting on the floor.
(2) Cut and fold back the metal straps at all edges of the case.
(3) Remove the nails with a nail puller. Remove the cover and the sides from the case.
(4) Remove the waterproof barrier and all filler material.
(5) Cut and fold back the metal straps that hold the switchboard to the pallet.
(6) Carefully raise the switchboard to its upright position.
(7) Remove the rear cover.
(8) Remove the minor components, desiccant, and all blocks and braces used to protect the unit during shipment.

11. Checking Unpacked Equipment

Check the equipment against the packing list. When no packing list accompanies the equipment, the list of components (par. 5) may be used as a general checklist to indicate the equipment which probably was packed. However, the absence of a minor component which does not affect the overall functioning need not prevent the equipment from being used.

12. Equipment Layout

Locate the switchboard where the attendant will have an unobstructed view of the annunciator and enough room to operate efficiently. There should be at least a 3-foot clearance between the back of the switchboard and any wall or obstruction to permit access to the rear of the switchboard for maintenance. Artificial lighting, with no direct light on the face equipment or the annunciator, is recommended for the switchboard room. An emergency power source (such as Power Unit PE–75) for the switchboard room lights' the battery charging rectifier, and the ringer should also be provided for use during power failures (par. 27).

13. Installation of Lamps and Fuses

The switchboard is shipped with all lamps, lamp caps, and fuses removed.

a. Install the lamps and lamp caps in the face equipment and keyshelf (fig. 1).

b. Install the electron tube JAN type 359A and the 120-volt ac screw base lamp from the rear of the switchboard.

c. All fuses are open-link type rated at 2 amperes. For the working circuits, 20 fuses are required. Install them on the fuse panel in the rear of the switchboard (fig. 7).

14. Installation of Annunciator Release Switch

The switchboard is completely equipped and wired internally except for the annunciator release switch (par. 5). Obtain the switch and mount it in the right-hand panel of the face equipment above the jacks (fig. 4). Connect the switch after wiring the annunciator circuit (par. 20).

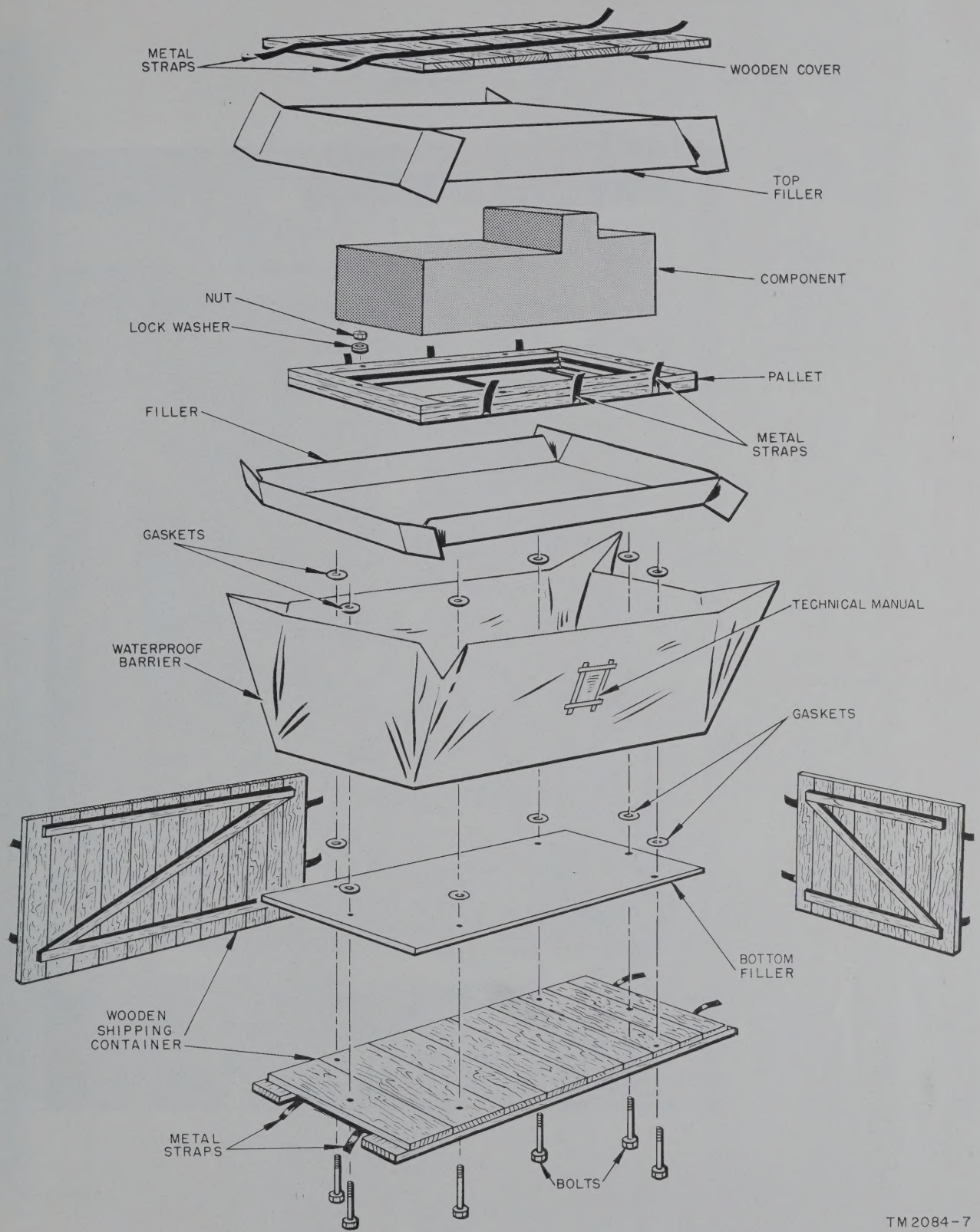


Figure 3. Telephone Switchboard SB-55(*)/FTC, packaging diagram.

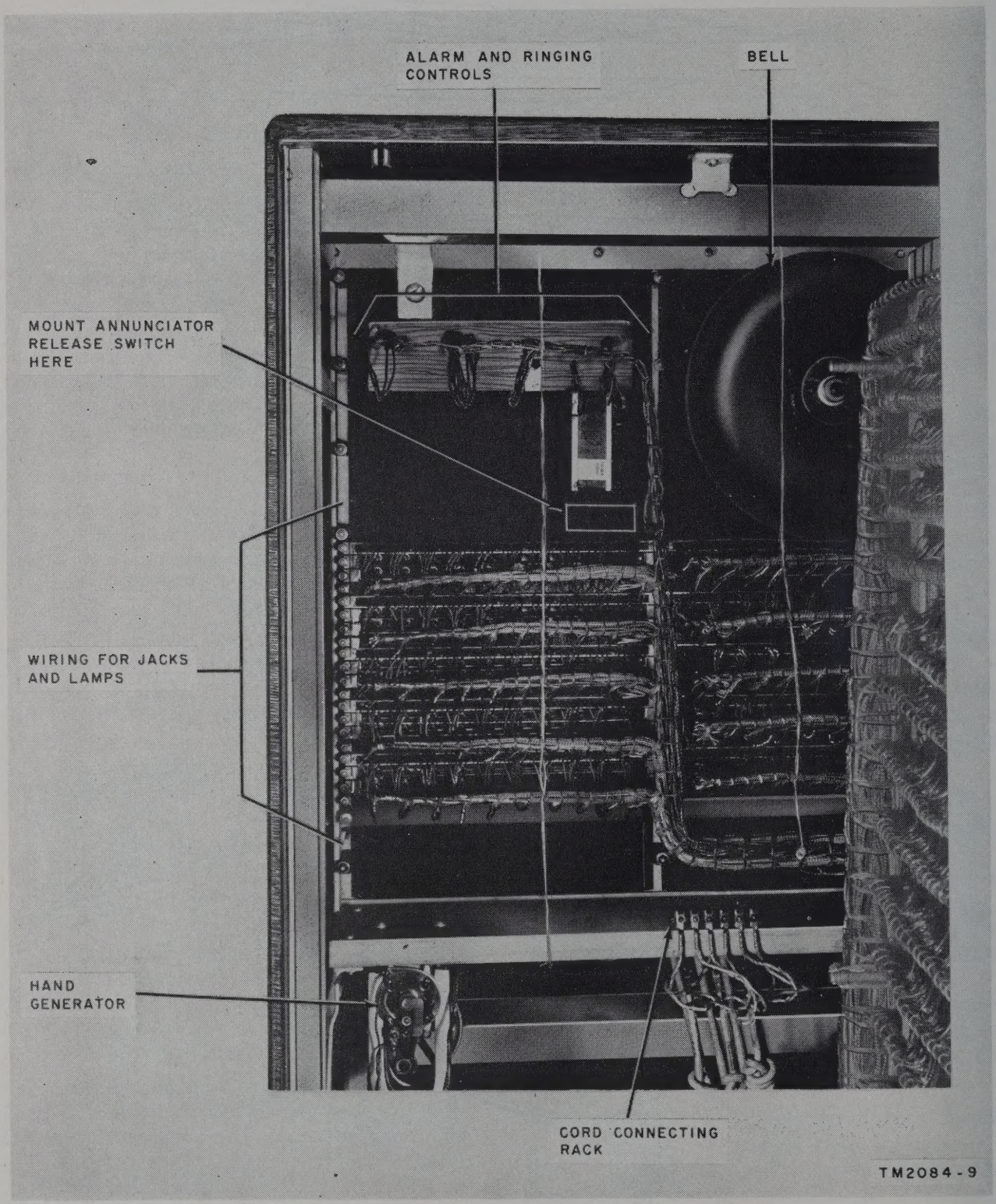


Figure 4. Interior view of switchboard, upper section.

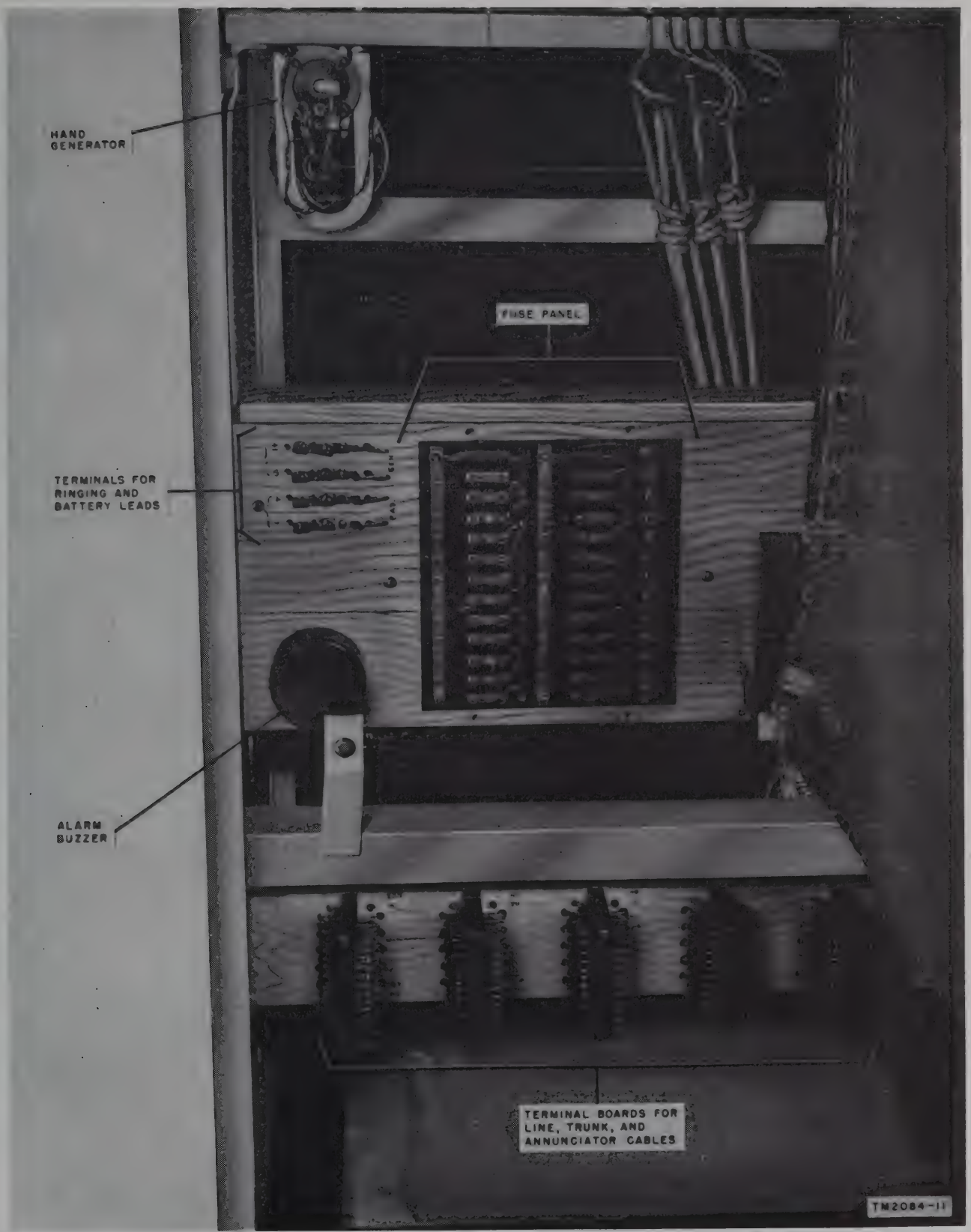


Figure 5. Interior view of switchboard, lower section.

15. Installation of Additional Equipment Required

a. Mount the annunciator (par. 7) on the wall facing the switchboard operator; use lag screws or expansion bolts as required. Place it high enough to give the operator an unobstructed view of the entire cabinet.

b. Install the battery, rectifier, ringer, and distributing frame in a well-ventilated room adjacent to the switchboard room. Build a rack of lumber for mounting the battery. Mount the rectifier, ringer, and distributing frame on the wall with lag screws or expansion bolts.

Section II. CONNECTIONS

Note. Before making any connections, open the back of the switchboard and remove the covers from all LO relays. Cut a sheet of bond paper into strips ¼ inch by 1 inch. Insert one strip between contacts 1 and 2 (lower and middle spring) of each LO relay. This will prevent the alarm bell from ringing when the batteries are connected to the switchboard. Replace all relay covers.

16. Ringer Circuit

(fig. 6)

Note. Use No. 14 gage or larger wire for the ringing leads.

a. Remove the ringer cover and the ringer fuse compartment cover to gain access to the connecting terminals.

b. Run two leads from the 110-volt 60-cps power supply through the INPUT porcelain bushing in the base of the ringer. Connect the leads to the terminals marked AC and G in the fuse compartment. (The grounded side of the power supply must be connected to the terminal marked G.)

c. Run three leads through the OUTPUT bushing: two to the switchboard and one to a water pipe or other equivalent ground.

(1) Connect the ringer end of one lead to the terminal marked GND and the other end to the water pipe; use a suitable ground clamp.

(2) Connect the ringer ends of the other two leads to the terminals marked 20-CYCLE OUTPUT 1 and 2 respectively. Connect the switchboard ends to the terminals marked GEN ± and G respectively.

17. Battery Circuit, 48 Volts

(fig. 6)

Note. Use No. 12 gage or larger wire for the battery supply leads.

a. Storage Battery.

(1) Connect the batteries in series.

(2) Connect one lead from the positive terminal of the storage battery to a water pipe or equivalent ground.

(3) Connect two leads from the positive and negative terminals of the storage battery to the BAT. + and − terminals respectively in the switchboard.

b. Rectifier.

(1) Open the cover of the rectifier case to gain access to the connecting terminals and controls.

(2) Be sure that the AC LINE switch is in the OFF position.

(3) Run two leads from the 110-volt 60-cps power supply through the porcelain bushing on the left side of the rectifier case. Connect the leads to the rectifier terminals marked AC LINE. Do not connect to the power supply until the batteries are ready to be charged.

(4) Connect two leads from the positive and negative terminals of the battery through the porcelain bushing on the right side of the case to the DC LOAD + and − terminals respectively in the rectifier.

18. Line and Trunk Circuits

(fig. 6)

a. Run color-coded cable (102 pairs with several spare pairs) from the distributing frame to the switchboard.

b. Connect the distributing frame end of the cable to line terminals T and R, circuits 1 through 100 and to trunk terminals T and R, circuits 1 and 2. Assign the color code to identify the circuits; use one twisted pair per circuit.

c. Connect the switchboard end of the cable to the T and R terminals of line circuits 1 through 100, and to the T and R terminals of trunk circuits 1 and 2; use the color code to identify the circuits. Make these connections on the five line terminal boards and the miscellaneous ter-

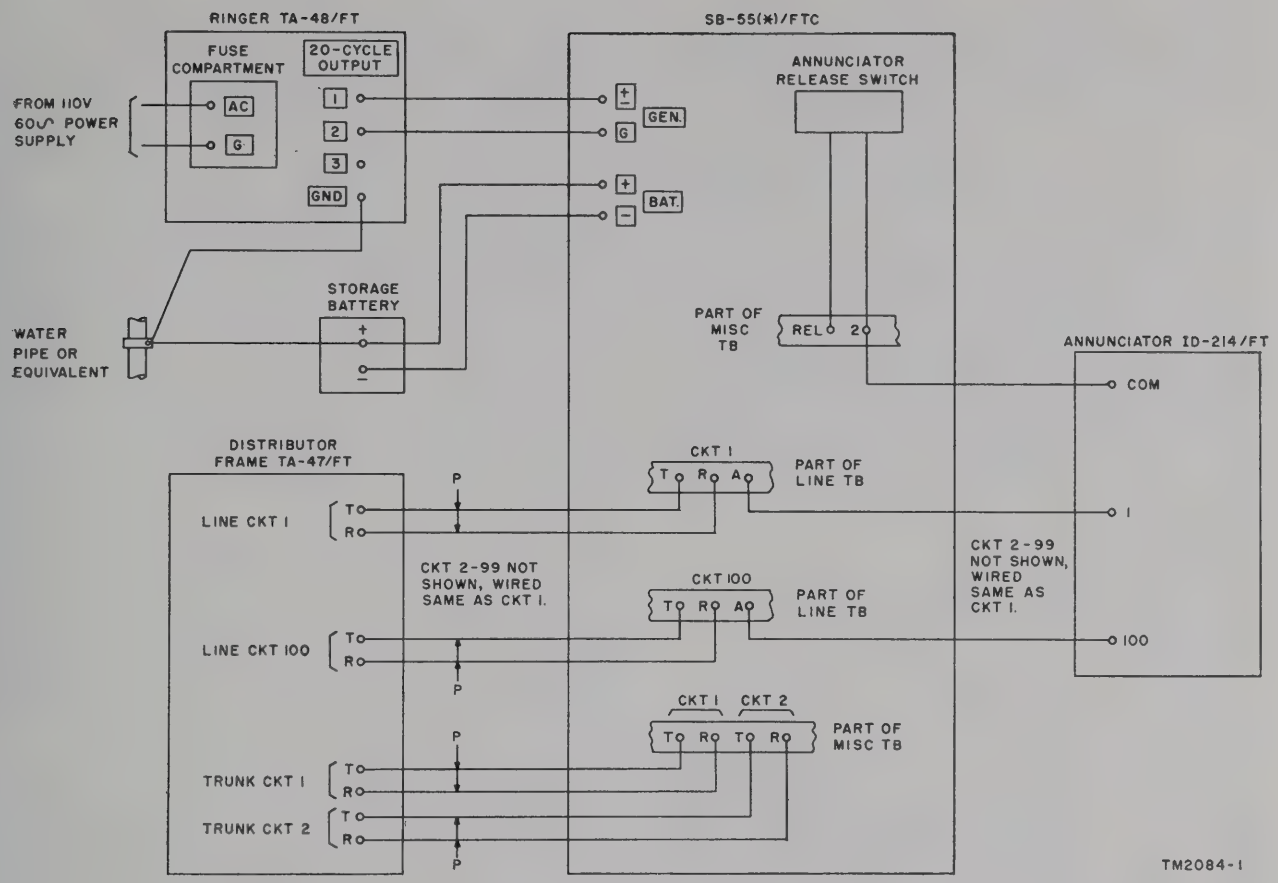


Figure 6. Connections diagram.

minal board which are mounted on the connecting rack (fig. 5).

Note. Do not split any pairs in the line circuit cable. If a single wire tests open, substitute a spare pair. Split pairs will cause transmission losses and crosstalk.

19. Annunciator Circuit

(fig. 6)

a. Run color-coded cable from the switchboard to the annunciator cabinet (101 conductors required).

b. At the switchboard, connect one conductor to the A terminal of line circuits 1 through 100. Assign the color code to identify the circuits. The connections are made on the five line terminal boards.

c. Connect the extra conductor to terminal 2 on the miscellaneous terminal board.

d. At the annunciator cabinet, identify the leads by color code and connect them to terminals 1 through 100 on the annunciator terminal board. Connect the extra conductor to the terminal marked COM.

20. Annunciator Release Switch

(fig. 6)

a. At the switchboard, run two No. 20 gage leads from the miscellaneous terminal board to the annunciator release switch.

b. At the switch, connect one lead to the stationary contact and one to the movable contact.

c. Strap the stationary contacts together and strap the movable contacts together for contact reliability.

d. At the miscellaneous terminal board, connect the two leads to the terminals marked REL and 2, respectively.

21. Heater Circuit (SB–55A/FTC Only)

(fig. 2)

a. Run a two-conductor No. 12 BX cable from the 110-volt 60-cps power source to the heater receptacle junction box in the base of the switchboard.

b. Connect the armored sheath of the cable to the junction box with a standard type BX connector.

c. Splice and tape the two BX conductors to the two wire ends found in the junction box. Connect white to white and black to black.

Warning: The armored sheath of the BX cable must be unbroken and all metallic parts bonded to ground for the protection of personnel.

Section III. PREOPERATIONAL PROCEDURES

22. General

When the installation of the SB–55(*)/FTC is completed, operational tests of all circuits should be made as outlined below. Tools and test equipment required are listed in paragraphs 33 and 34. If any circuit fails to meet the specified requirements, refer to the troubleshooting chart (par. 39) and to par. 59 to correct troubles in the power distribution circuits.

23. Preoperational Tests

a. Power Sources. Check the power sources for the following:

Equipment	Input	Output
Rectifier	60 cps 110 v ac.	48.5 to 50.5 vdc for load variation of .3 to 2.4 amp.
Ringer	60 cps 110 v ac.	17 to 20 cps, 70 to 90 v ac.
Storage battery	48.5 to 50.5 vdc.	48 vdc.

b. Fuses. All fuses in the SB–55(*)/FTC are rated at 2 amperes. Check rating, continuity, and circuit assignment (fig. 7).

c. Lines. Check the 100 line circuits from the distributing frame to the switchboard. Simulate station conditions with a Telephone TA–105/FTC (modified, par. 7*b*) connected to the T and R terminals at the distributing frame. Remove the bond paper insulator from contacts 1 and 2 of the LO relay of the circuit under test. Refer to the operating procedure (par. 26) to check the lines and trunks. Replace the insulator between contacts 1 and 2 of the LO relay after the test is completed.

d. Trunks. Check for ringing, transmission, and supervision on the two trunk circuits after they have been connected to the post switchboard (par. 26).

e. Annunciator. Check the annunciator lamps and release switch while checking the line circuits (par. 26).

f. Alarms. Simulate all alarm conditions indicated in the operating procedure for a check of the lamps, buzzer, and bell in the alarm circuits (par. 26).

24. Checking Outside Lines

a. During the installation of telephones at emergency reporting stations, check the line loop resistance at the distributing frame with Multimeter ME–77/U. Instruct the station equipment installer to adjust the variable resistor connected across L1 and L2 of the telephone until the total loop resistance is approximately 3,800 ohms.

b. As each telephone installation is completed, remove the bond paper insulated from the LO relay (see Note under sec. II) and test the line-out alarm feature of that line circuit (par. 30). Leave the insulator out on all assigned lines.

c. Be sure that contacts 1 and 2 of relay LO are insulated on all unassigned lines.

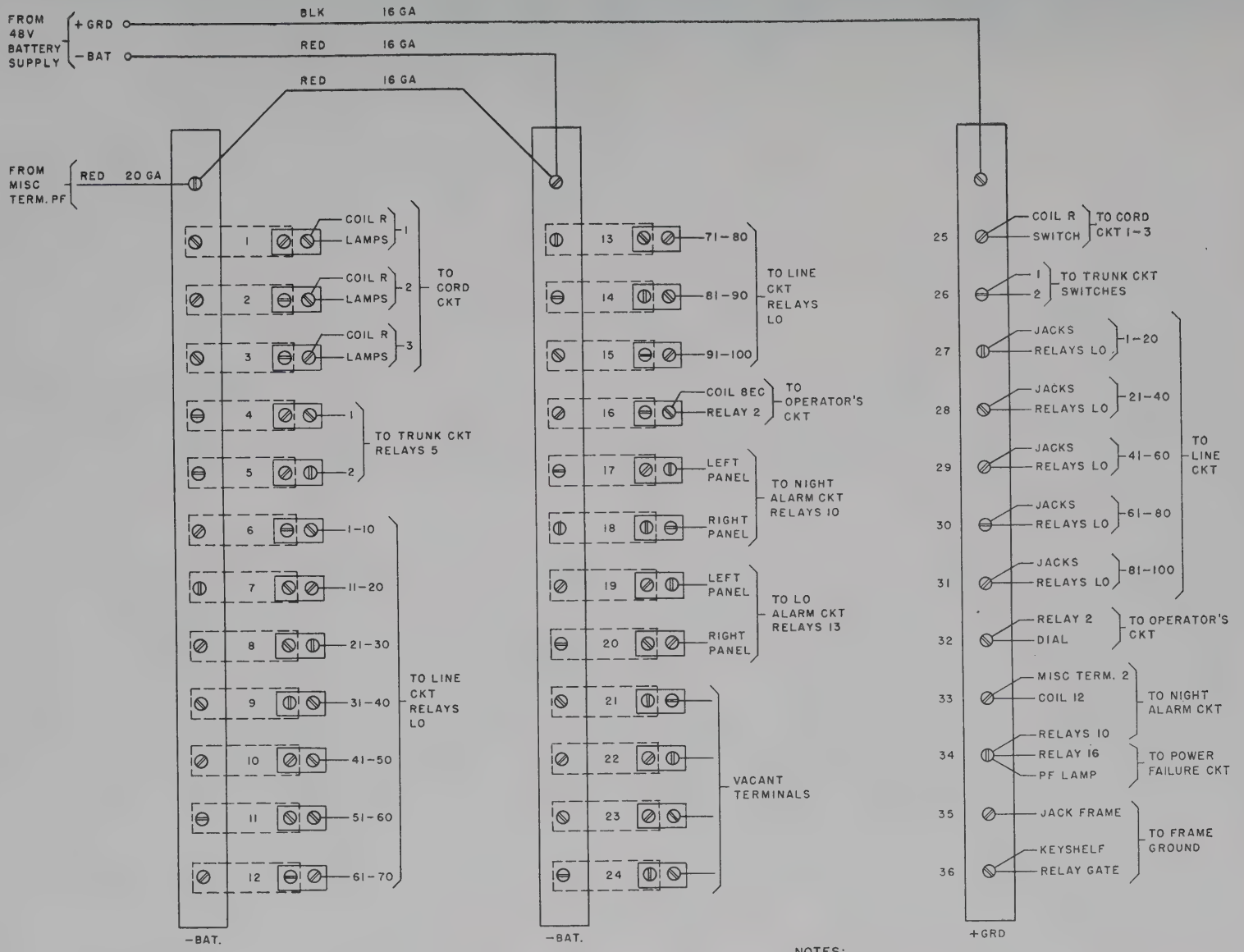


Figure 7. Circuit assignment on fuse panel.

CHAPTER 3
OPERATING INSTRUCTIONS

25. Controls

Note. This paragraph describes, locates, illustrates, and gives the function of all controls (switches, plugs, and lamps) used by the operator.

a. Keyshelf (fig. 8).

Control	Function
Cord plug	Used to connect operator's circuit to line jacks.
Cord supervisory lamp (red).	Lights when cord plug is inserted into idle line jack. Goes out when called party answers. Relights when called party hangs up.
Line-out lamp (white)	Lights when cord is in jack of open line. Goes out when trouble is cleared.
TALK-RING switch	Three position lever switch: TALK position (locking)—connects operator's circuit to cord. RING position (nonlocking)—connects ringing current to cord. Normal position (locking)—disconnects cord circuit from operator's circuit and ringing circuit.
HOLD-TALK-NORMAL switch.	Three position lever switch (locking in all positions): HOLD position—places holding bridge on trunk and disconnects operator's circuit from trunk. TALK position—connects operator's circuit to trunk. NORMAL position—disconnects operator's circuit from trunk circuit and from holding bridge.
Trunk supervisory lamp (green).	Lights to indicate an incoming call from the post telephone switchboard.
Dial	Permits operator to control equipment in dial exchange over trunks.
Hand generator crank (located on keyshelf apron).	Provides operator with emergency ringing source during ringing failure.

b. Face Equipment (fig. 9).

(1) *Line controls.*

Control	Function
Line lamp (red)	Lights to indicate incoming call.
Line-out lamp (white)	Lights if line goes open.

(2) *Alarms.*

Control	Function
POWER FAILURE LAMP (amber).	Normally lighted lamp. Goes out if battery is discharged or power supply fuse operates.
RINGING LAMP (white)	Lights when ringing current is applied to any line. Failure to light indicates trouble in ringing circuit.
RINGING TRANSFER KEY.	Two position rotary switch: POWER GEN. position—connects automatic ringing to cord circuits. HAND GEN. position—connects the hand generator to the cord circuits.
BUZZER CUT OFF KEY	Two position rotary switch: ON position—connects buzzer to sound on alarms. OFF position—disconnects buzzer from alarm circuits.
Annunciator release switch	Two position push-type switch: Normal position—connects lock-in feature for annunciator lamps. Operated position—releases annunciator signal.
Heater switch (SB–55A/FTC only).	Two position lever switch: ON position—connects heater circuit. OFF position—disconnects heater circuit.

26. Operating Procedure

a. General. The operation of the SB–55(*)/FTC is completely different and much simpler than that of a conventional telephone switchboard. The operator of a conventional switch-

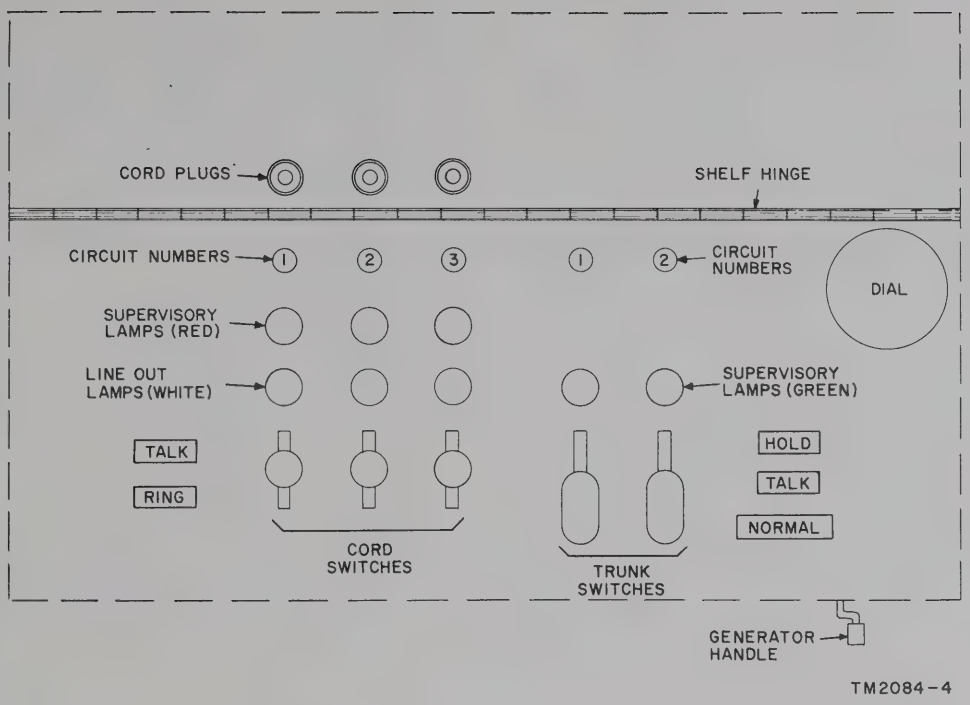


Figure 8. Keyshelf controls.

board is constantly engated in interconnecting user lines and trunks, but the SB–55(*)/FTC operator answers very few calls. Each call, however, may be an emergency and demand instant attention. All station lines terminate at emergency fire reporting telephones, and the operator has three cords to use when answering calls from or making calls to these stations. The operator does not interconnect these lines. Two trunks are provided for the operator to receive fire calls from or to communicate with the post telephone switchboard. Cords are not used on trunk calls.

b. Answering Emergency Reporting Line Call.

(1) When the bell rings, note which of the emergency reporting line lamps (red) is lighted and which station number appears on the annunciator panel.

(2) Insert a cord plug into the associated jack and operate the switch in line with the cord to the TALK position.

(3) Answer with the hand telephone.

(4) When the cord supervisory lamp (red) lights, take down the cord and restore the switch.

(5) Operate the annunciator release switch.

c. Answering Call From Post Telephone Switchboard.

(1) When a trunk supervisory lamp (green) lights and the bell rings, operate the associated trunk switch to the TALK position.

(2) Answer with the hand telephone.

(3) When the call is completed, restore the trunk switch to the NORMAL position.

d. Calling Emergency Reporting Line.

(1) Insert a cord plug into the desired line jack and operate the switch to the RING position. The cord supervisory lamp (red) will light when the plug is inserted into the jack and will go out when the called line answers.

(2) Operate the switch to the TALK position and use the hand telephone.

(3) When the cord supervisory lamp (red) relights, take down the cord and restore the switch.

e. Calling Post Telephone Switchboard.

(1) Operate a trunk switch to the TALK position and wait for the post switchboard operator to answer. The trunk supervisory lamp will not light. If connected to a dial trunk, dial tone will be heard.

(2) When the call is completed, restore the switch to the NORMAL position.

f. Hold Feature.

(1) If an emergency reporting line lamp lights during the progress of a trunk

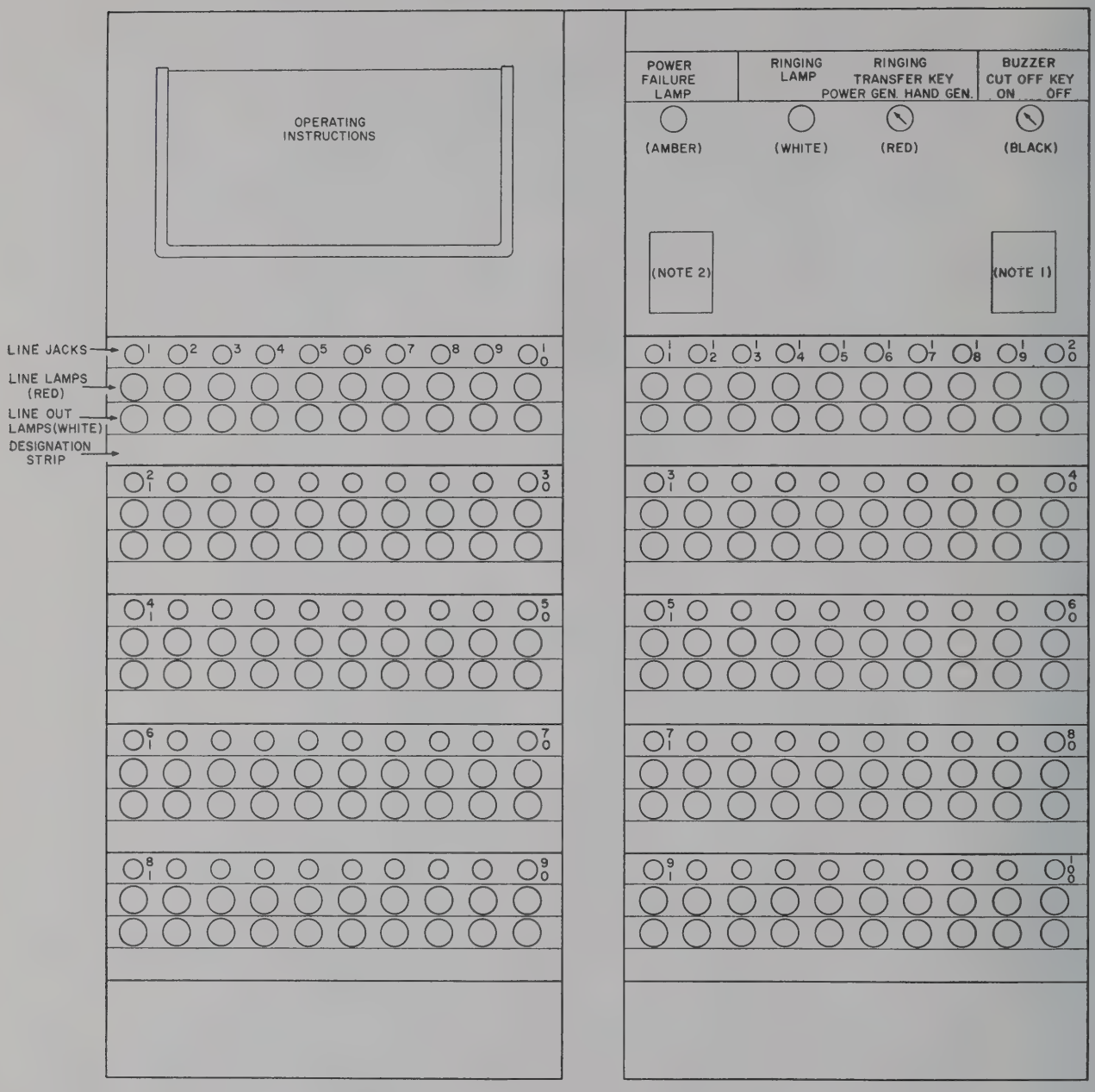


Figure 9. Face equipment and alarm controls.

call, operate the trunk switch to the HOLD position.

(2) Answer the emergency line call (*b* above).

Note. The operator cannot talk through the cords while *either trunk switch* is in the TALK position.

(3) Operate the trunk switch to the TALK position to re-establish the connection to the trunk call.

g. Alarms.

(1) *Ringing power failure.* If the RINGING LAMP (white) fails to light when a cord switch is operated to the RING position, operate the RINGING TRANSFER KEY to the HAND GEN. position. To signal the called line, turn the crank of the hand generator while holding the

cord switch in the RING position. Report the trouble to the repairman and restore the RINGING TRANSFER KEY to the POWER GEN. position after the trouble has been cleared.

(2) *Emergency reporting line out of order.* If a line-out lamp (white) lights and the buzzer sounds, the line associated with the lamp is out of order. Report the trouble to the repairman. Silence the buzzer and extinguish the lamp by inserting a cord plug into the jack. The cord line-out lamp (white) will light. When the cord lamp goes out, remove the cord.

(3) *Power and fuse alarm.* If the amber lamp marked POWER FAILURE LAMP goes out, an open fuse in the power supply or a discharged battery is indicated. Report the trouble to the repairman. The lamp will light when the trouble is cleared. The buzzer will sound when the lamp goes out and may be silenced by turning the BUZZER CUT OFF KEY to the OFF position.

27. Operation Under Unusual Conditions

The switchboard operating procedure (par. 26) is the same under all conditions; however, facilities for operation during power failures should be provided. A power unit such as Power Unit PE–75(*) TM 11–900 and TM 11–900A can be used as a standby emergency power source to provide the necessary 110 volts 60 cps required for the ringer, the battery charging rectifier, and the switchboard room lights. A double-pole, double-throw switch should be used in the power input cabling for a quick changeover from normal to emergency power.

CHAPTER 4
ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. SWITCHBOARD OPERATOR'S MAINTENANCE

28. Scope of Switchboard Operator's Maintenance

The switchboard operator's maintenance consists of preventive maintenance of the switchboard (par. 29), a daily check of the line-out alarm feature on all lines (par. 30), and close observance of normal indications during operation (par. 31). First echelon preventive maintenance checklist (DA Form 11–242) will be filled out by the organizational maintenance personnel as explained in paragraph 35. Any deficiencies noted by the switchboard operator should be reported to the repairman immediately.

29. Switchboard Operator's Preventive Maintenance Procedures

a. Daily.

(1) Wipe all dust and moisture from the keyshelf, cord plugs, dial, cord circuit switches, face equipment, and the handset with a dry lint-free cloth.

(2) Lift the cord plugs (one at a time) high enough to reach the top jacks and release them. See that the cords are fully retracted when released.

(3) Operate the dial to the 0 position and release it. Be sure the dial restores to normal.

(4) Inspect the designation strips for legibility and changes in station numbers.

(5) Test the line-out alarm feature on all assigned lines (par. 30).

b. Weekly.

(1) Inspect all exterior surfaces for loose or missing screws, chipped paint, rust or corrosion.

(2) Inspect the cords for frayed insulation and loose or broken plugs and plug shells.

(3) Inspect all switches for positive action and bent or broken handles. Operate cord and trunk switches to all positions. Listen for cutouts and clicks in the operator's receiver. Tap the switch tops lightly while listening.

30. Line-Out Alarm Test

This test verifies the reliability of the outside lines and must be performed by the operator once each day on all assigned lines. A test plug (fig. 10) is provided with the switchboard for making this test. The word UP engraved on the handle of the test plug indicates the position of the plug for insertion into the line jacks.

a. Insert the test plug into the line jack. Be sure the line-out lamp (white) lights and the buzzer sounds.

b. Withdraw the plug from the jack. The lamp will go out and the buzzer will be silenced.

c. Report any circuit that fails to meet the requirements of this test to the repairman at once.

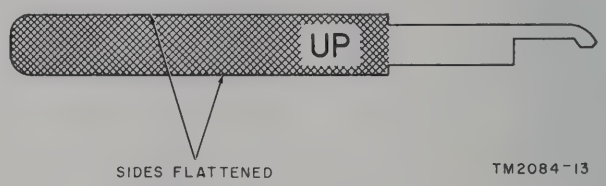


Figure 10. Line-out alarm test plug.

31. Operator's Checklist

a. General. Semimonthly checks are made from each fire reporting station to the switchboard to verify that each circuit is trouble-free. The operator's check list summarizes the operator's actions and the normal indications that result from these actions when answering these test calls. Because of the critical nature of fire reporting circuits, the operator should not attempt to perform any corrective measures. If normal indications are not obtained, notify the repairman at once.

b. Checklist.

Item No.	Item	Action or condition	Normal indication
1	Emergency reporting line lamp (red).	Incoming call from fire reporting station	Bell rings, emergency reporting line lamp lights, and annunciator lamp lights.
2	TALK-RING switch	*a.* Insert plug of associated cord into line jack above incoming signal.	*a.* Cord supervisory lamp lights momentarily, emergency reporting line lamp goes out, and the bell is silenced.
		b. Operate switch to TALK position	*b.* Calling party can be heard.
		c. Request calling party to hang up and stand by.	*c.* Cord supervisory lamp (red) lights.
		d. Operate switch to RING position	*d.* RINGING LAMP (white) lights. Cord supervisor lamp remains lighted.
		e. Operate switch to TALK position	*e.* RINGING LAMP goes out. Cord supervisory lamp remains lighted until called station answers.
		f. Called station answers	*f.* Emergency line lamp lights. Goes out when cord-plug is inserted into jack.
		g. Dispatch calling party to next station to be tested, take down cord, and operate annunciator release switch.	*g.* Annunciator lamp goes out.
3	HOLD-TALK-NORMAL switch	Operte to TALK position	Sidetone is heard in operator's telephone circuit. Post switchboard operator will answer. If dial service is provided, dial tone will be heard. Trunk supervisory lamp (green) will not light.
4	Trunk supervisory lamp (green)	Request post switchboard to call back and restore switch to NORMAL position.	Bell rings and trunk supervisory lamp (green) lights.
5	HOLD feature	*a.* Operate switch to TALK position	*a.* Connection established to post switchboard. Trunk supervisory lamp (green) goes out.
		b. Instruct post switchboard operator to stay on line then operate switch to HOLD position.	*b.* Operator's circuit disconnected from trunk for use on emergency reporting lines. Trunk call is held.
		c. Operate switch to TALK position	*c.* Connection re-established to trunk.
		d. Restore switch to NORMAL position	*d.* Trunk is released.
6	Cord lamps. Supervisory (red). Line out (white).	*a.* Insert plug of associated cord into spare (unassigned) line jack.	*a.* Both lamps light.
		b. Remove cord from jack	*b.* Both lamps go out.
7	Emergency reporting line-out lamps (white).	Momentarily insert line-out test plug into working line jack.	Emergency reporting line-out lamp (white) lights and buzzer sounds while test plug is in jack.
8	RINGING TRANSFER KEY	*a.* In POWER GEN. position with TALK-RING switch in RING position.	*a.* RINGING LAMP lights.
		b. In HAND GEN. position with TALK-RING switch in TALK position and hand generator crank being turned.	*b.* RINGING LAMP lights.
9	BUZZER CUT OFF KEY	*a.* ON position (always used)	*a.* Buzzer sounds on line-out alarm or discharged battery.
		b. OFF position	*b.* Buzzer silence.
10	POWER FAILURE LAMP (amber).	Lamp always lighted	Lamp goes out and buzzer sounds if 48-volt power fails. If lamp goes out and buzzer does not sound, a failure in the 110-volt ac power supply is indicated.

Note. Three cords are provided for the operator to use when answering calls from fire reporting lines. Use a different cord on each call to verify the cord circuits.

Section II. ORGANIZATIONAL MAINTENANCE PROCEDURES

32. Scope of Organizational Maintenance

a. The extent of organizational maintenance is limited by the available spare parts, tools, test equipment, and the skill of the personnel.

b. Organizational maintenance for Telephone Switchboard SB–55(*)/FTC consists of the following:

(1) All echelons of preventive maintenance (par. 35).
(2) Troubleshooting (pars. 36–39).
(3) Relay repairs, test, and adjustments (pars. 40–45).
(4) Repair and replacement of parts (pars. 46–49).

33. Materials, Tools, and Test Equipment

a. Materials and Tools.

Item	Use
Cleaing Compound[a] (FSN 7930–395–9542).	Used for cleaning relay contacts and for general purpose cleaning.
Toothpicks	Used to block relays operated and to separate contacts.
Lint-free cloth	Used for general cleaning purposes.
Bond paper	Used to clean gap between relay armature and core.

[a] Cleaning Compound is flammable and its fumes are toxic. Do not use near a flame; provide adequate ventilation.

Note. Additional materials and the tools required for installation and maintenance (except for special tools (par. 34)) are contained in Tool Equipments TE–49 and TE–111.

b. Test Equipment.

Item	Use
Test Set TS–190/U	Used to check continuity of wiring.
Test Set I–181 A or B, or equal.	Used to test relays.
Multimeter ME–77/U with Adapter MX–1471/U.	Used to make voltage and resistance measurements.

34. Special Tools

A canvas tool roll containing the special tools listed below is issued with Telephone Switchboard SB–55(*)/FTC.

Item	Federal stock No.	Use
5/16″ socket wrench, 18½″ long.	5120–224–2613	Used to remove jack strips.
3/8″ socket wrench, 8″ long.	5120–224–2630	Used to remove relays.
7/64″ socket wrench, 8″ long.	5120–224–2262	Used to remove lever switches.
¼″ socket wrench, 4¾″ long.	5120–224–2614	Used when adjusting relays.
7/16″ socket wrench, 5¼″ long.	5120–222–1499	Used to remove relay covers.
Contact burnisher	5120–223–9350	Used to clean relay and switch contacts.
Duckbill pliers	227–7096	Used when adjusting relays.
Spring adjuster (double-ended).	5120–247–1333	Used when adjusting relays.
Sprinh adjuster (single-ended with 90° bend and offset).	250–9164	Used when adjusting relays.
Spring adjuster (single-ended with 90° bend and no offset).	5120–224–2614	Used when adjusting relays.
Open-end wrench	5120–408–1959	Used when adjusting relays.
Lamp extractor	251–4499	Used to remove lamps from face equipment and keyshelf.
Crimping tool	6R40039 (Sig C).	Used when repairing cords.

35. Preventive Maintenance

Organization maintenance personnel perform all echelons of preventive maintenance checks on all components of the fire reporting system except the face equipment and keyshelf of the switchboard. The repairman should also check the switchboard to be sure that the operators are performing the preventive maintenance procedures properly.

a. Use of DA Form 11–242. DA Form 11–242 is the preventive maintenance checklist. Items not applicable on this form have been lined out in figures 11 and 12. References in the item block are to paragraphs in this manual containing additional information pertinent to the particular item.

	CONDITION
23. ~~INSPECT COVER GASKETS FOR LOOSENESS, BREAKS, AND INCORRECT SEATING.~~	
24. ~~CHECK OPERATION OF DRAWER SLIDES AND ROLLERS.~~	
25. INSPECT DISTRIBUTING FRAMES AND RACKS FOR LOOSE CONNECTIONS AND BROKEN PROTECTOR BLOCKS. CHECK FOR PROPER SEATING PROTECTOR BLOCKS & PLACEMENT OF CROSS CONNECTIONS.	✓

IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING THE INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

ITEM 5. Line out alarm does not operate on circuit 27

MAINTENANCE CHECK LIST FOR SIGNAL EQUIPMENT
MANUAL TELEPHONE AND TELEGRAPH CENTRAL OFFICES
(AR 750-625)

EQUIPMENT NOMENCLATURE: TELEPHONE SWITCHBOARD SB-55/FTC AND SB-55A/FTC.

EQUIPMENT SERIAL NUMBER:

INSTRUCTIONS

This form may be used for a period of one month by using the correct dates and weeks of the month. It is to be used as a Preventive Maintenance check list for Signal equipment in actual use, or for a check on equipment prior to issue.

1. For detailed Preventive Maintenance instructions see:
   a. The Technical Manual *(in TM 11 series)* for the equipment. *(See DA Pamphlet Number 310-4)*
   b. The Supply Bulletin *(SB 11-100 series)* for the equipment. *(See DA Pamphlet Number 310-4)*
   c. The Department of the Army Lubrication Order. *(See DA Pamphlet Number 310-4)*

2. The following action will be taken by either the Communications Officer/Chief for 1st echelon, or the Inspector for higher echelon:
   a. Enter Equipment Nomenclature and Serial Number.
   b. Strike out items that do not apply to the equipment.

3. Operator/Inspector will enter in the columns entitled CONDITION, on the proper line, a notation regarding the condition, using symbols specified under LEGEND.

4. After operator completes each daily inspection he will initial over the appropriate dates under "Daily Condition for Month", then return form to his supervisor.

FOLD

TYPE OF INSPECTION

OPERATOR	2/3 ECHELON	DATE	SIGNATURE
✓		7 Oct '57	J. Jones
	✓	30 Oct '57	B. Brown

4

DA FORM 1 MAY 57 11-242

REPLACES DA FORMS 11-242, 1 MAY 51 AND 11-243, 1 DEC 55, WHICH ARE OBSOLETE.

TM2084-5

Figure 11. DA Form 11-242, pages 1 and 4.

LEGEND for marking conditions:
Satisfactory, ✓.
Adjustment, Repair or Replacement required, X.
Defect Corrected, (X).

DAILY CONDITION FOR MONTH OF OCTOBER 1957

NO.	DAILY ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	2D 3D ECHELON
1.	CLEAN DIRT AND MOISTURE FROM EXPOSED SURFACES OF SWITCHBOARDS, JACK PANELS, KEYSHELVES. ~~CASES AND HOUSINGS, INTERCONNECTING CABLING, ETC.~~																	✓	✓	✓	✓	✓	✓	(X)									✓
2.	~~INSPECT INTERCONNECTING CABLES FOR CORRECT POSITIONING, KINKS AND STRAINS.~~																																
3.	~~CHECK STORAGE BATTERIES FOR EVIDENCE OF GASSING OR ELECTROLYTE LEAKAGE. CLEAN AS REQUIRED.~~																																
4.	CHECK SWITCHBOARD CORDS FOR FULL RETRACTION ON ~~CORD REELS OR~~ CORD SHELF. PAR. 29a																	✓	✓	✓	✓	✓	✓	✓									✓
5.	DURING OPERATION BE ALERT FOR ANY UNUSUAL PERFORMANCE OR CONDITION. PAR. 28																	✓	✓	✓	✓	✓	✓	X									✓

WEEKLY	CONDITION EACH WEEK 1ST	2D	3D	4TH	5TH	2D 3D ECH
6. ~~INSPECT ALL EXTERNAL CABLE CONNECTORS FOR FIRMNESS OF SEATING AND EVIDENCE OF FUNGUS OR CORROSION. HAND TIGHTEN TO A~~ SNUG FIT.						
7. INSPECT THE EXTERIOR SURFACES OF COMPONENTS FOR LOOSE OR MISSING MOUNTING SCREWS, CHIPPED PAINT, RUST OR CORROSION. ~~BROKEN LATCHES AND FASTENINGS.~~	✓					✓
8. INSPECT INTER-CONNECTING CABLES FOR DAMAGED INSULATION AND JACKETING, SHARP BENDS, KINKS OR STRAINS. PAR. 35b						✓
9. INSPECT SWITCHBOARD CORDS FOR FRAYED JACKETING, LOOSE PLUGS OR PLUG SHELLS. INSPECT PLUGS FOR CHIPPED INSULATORS AND TARNISH. ~~CLEAN AND TIGHTEN.~~ PAR. 29b(2)	✓					(X)
10. INSPECT SWITCHBOARD ~~AND POWER BOARD~~ KEYS AND SWITCHES FOR SECURE MOUNTING AND POSITIVE ACTION. CHECK FOR BROKEN HANDLES OR LEVERS. PAR. 29b(3)	✓					✓
11. INSPECT CORD CIRCUIT "TALK KEYS" FOR POSITIVE ACTION, CUT-OUTS AND CLICKS. THROW THE KEY TO THE "TALK" POSITION AND TAP THE KEY TOP LIGHTLY. LISTEN FOR EVIDENCE OF CUT-OUTS OR CLICKS IN THE OPERATOR'S HEADSET. PAR. 29b(3)	✓					✓
12. CHECK STORAGE BATTERY ELECTROLYTE LEVEL AND SPECIFIC GRAVITY. ADD WATER IF REQUIRED. CLEAN BATTERY TOP AND CONNECTOR OF ELECTROLYTE SPRAY OR SULPHATION. PAR. 35b						✓
13. INSPECT GROUND ~~ROD~~ FOR ~~FIRM EMBEDDING;~~ LOOSE OR CORRODED CONNECTIONS.						✓

ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS	CONDITION
14. INSPECT THE EXTERIOR SURFACES ~~OF CASES AND HOUSINGS~~ FOR LOOSE OR MISSING MOUNTING AND ASSEMBLY SCREWS, ~~BROKEN LATCHES AND FASTENINGS~~, CHIPPED PAINT, RUST OR CORROSION.	✓
15. INSPECT INTERCONNECTING CABLES FOR DAMAGED INSULATION AND JACKETING, SHARP BENDS, KINKS, STRAINS AND CORRECT POSITIONING. ~~INSPECT ALL EXTERNAL CABLE CONNECTORS FOR FIRMNESS OF SEATING AND EVIDENCE OF FUNGUS OR CORROSION. HAND TIGHTEN TO A SNUG FIT.~~ PAR. 35b	✓
16. INSPECT SWITCHBOARD CORDS FOR FULL RETRACTION ON ~~CORD REELS OR~~ CORD SHELVES, FRAYED JACKETING, BROKEN CONDUCTORS, LOOSE PLUGS OR PLUG SHELLS. INSPECT PLUGS FOR CHIPPED INSULATORS AND TARNISH. CLEAN AND TIGHTEN. PAR. 35b	✓
17. CLEAN INTERIOR OF SWITCHBOARDS, TRUNK AND LINE UNITS, ~~POWER BOARDS, TELETYPEWRITER SETS, ETC.~~ OF DIRT AND MOISTURE. INSPECT FOR LOOSE MOUNTING SCREWS, BROKEN FASTENERS AND MOUNTING BRACKETS.	✓
18. INSPECT INTERIOR WIRING HARNESSES FOR CORRECT POSITIONING, FRAYED OR ABRAIDED INSULATION, LOOSE, BROKEN OR CORRODED CONNECTIONS. PAR. 35b	✓
19. INSPECT THE RETAINING FASTENERS AND SEATING OF PLUCK-OUT ITEMS. DO NOT REMOVE, ROCK OR TWIST. USE ONLY A DIRECT PRESSURE TO INSURE THAT EACH ITEM IS FULLY SEATED.	✓
20. ~~INSPECT ELECTROLYTE CAPACITORS FOR LEAKS AND BULGES.~~	
21. ~~INSPECT POWER SUPPLY RESISTORS FOR CRACKS, BLISTERING, DISCOLORATION AND EVIDENCE OF OVER-HEATING.~~	
22. ~~INSPECT INSULATOR BUSHINGS FOR DAMAGE AND PROPER PLACEMENT.~~	

CONTINUED ON PAGE 4

2 3

GPO:1957 O—427080

TM2084-12

Figure 12. DA Form 11-242, pages 2 and 3.

b. Items.

Item	Maintenance procedure
8	Dress cables to eliminate kinks and relieve strains.
12	Cover battery terminal connections with a coating of vaseline to prevent corrosion after terminals have been cleaned.
15	Repair damaged insulation with tape and shellac.
16	Polish cord plugs with jeweler's rouge or other non-abrasive plug polish.
18	Inspect for wire clippings between terminals on terminal boards.

c. Additional Maintenance Procedures.

(1) Check the voltmeter and ammeter on the battery charging certifier once each day to be sure that the batteries are being charged at the proper rate. If necessary, adjust the controls on the rectifier to correct the charging rate.

(2) If an emergency power unit is used (par. 27), start it once each week. After running the unit for a few minutes, throw the switch that will change the power from normal to emergency. Permit the emergency power unit to carry the load. Check the battery charging rate during emergency operation. After 1 hour, restore the system to normal power.

Section III. TROUBLESHOOTING

36. General Troubleshooting Procedures

When a circuit is reported out of service, perform the visual inspection (par. 37) for obvious defects which can be corrected immediately. If the visual inspection does not reveal the source of trouble, test the circuit as explained in paragraphs 23 and 24. The test will indicate the symptoms of the trouble. After the symptoms are known, refer to the troubleshooting chart (par. 39) for information concerning the probable cause and the necessary corrective action.

37. Visual Inspection

When a line or trunk circuit is reported out of service, check the circuit as described in *a* and *b* below, to be sure that all connections are properly made and that all components are operating properly.

a. At the distributing frame—

(1) Check the incoming line or trunk wires. Be sure that both wires are properly terminated on the binding posts.

(2) Check the cross connections to be sure that they are properly connected at both ends and that the T and R leads are not reversed.

(3) Check the lightning arresters associated with the line for shorts.

(4) Check the soldered cable conductors. Be sure they are not loose or broken from the terminals.

(5) Use the multimeter to check continuity from the line side of the lightning arresters to the cable conductors.

b. At the switchboard—

(1) Remove the back of the switchboard.

(2) Check the soldered connections of the defective circuit on both sides of the line terminal board.

(3) Open the gate and check for broken wires and shorted terminals on the wiring side of the circuit components.

(4) Check the wiring side of the jacks for broken wires or shorted terminals.

(5) Remove the dust covers from the relays of the defective circuit.

(6) Refer to the schematic diagram (fig. 20) and check the sequence of operation of the relays (pars. 51–53).

(7) Use Test Set TS–190/U and check for battery and ground at the contacts and winding terminals of the circuit components.

c. Refer to the troubleshooting chart (par. 39) if the trouble is not located after these procedures have been completed.

38. Localizing Troubles

a. General. The procedure for localizing trouble which will affect the operation of the SB–55(*)/FTC must cover the additional equipment required (par. 7) to complete a fire reporting system. The troubleshooting chart will include references to the other equipments.

b. Potential Trouble Points. The following list includes the most likely locations of troubles in the fire reporting system. These points should be checked before the circuit components are tested.

(1) Outside line wire terminations (binding posts).
(2) Lightning arresters.
(3) Cross connections.
(4) Terminations of interconnecting cables.
(5) Relay contacts.
(6) Internal wiring of circuit components (jacks, lamps, relays, etc.).

c. Use of Chart. The troubleshooting chart is designed to supplement the preoperational test procedures. If the operational symptoms of the trouble are not known, test the circuit as explained in paragraphs 23 and 24. Corrective measures are covered in paragraphs 37, 41, 44, 45, 47, and 49. All fuses are shown on figure 7.

39. Troubleshooting Chart

Symptom	Probable trouble	Correction
No side tone in operator's circuit with TALK-RING switch in TALK position.	Contacts 3L–4L of TALK switch defective.	Clean or adjust contacts (par. 41).
	Operated fuse in operator's circuit	Replace fuse.
	Defective component in operator's circuit.	Test components and replace defective component.
	Broken wire in operator's circuit	Check continuity of wiring and repair connection.
Annunciator lamp does not light. Incoming lamp lights and bell rings.	Defective annunciator lamp	Replace lamp.
	Contacts 2L–3L of relay A defective	Clean or adjust contacts.
	Relay A fails to operate	Readjust relay A.
	Broken wire in annunciator cabling	Check continuity of wiring and repair connection.
Annunciator signal does not lock in	Defective annunciator release switch	Repair or replace switch.
	Broken ground connection at annunciator release switch.	Check continuity and repair connection.
	Contacts 2R–3R of relay A defective	Clean or adjust contacts.
	Open lockup winding on relay A	Repair or replace relay A.
Station cannot signal switchboard (no incoming lamp or bell).	Operated fuse in line circuit	Replace fuse.
	Defective line lamp	Replace lamp.
	Contacts 1R–2R of relay ER defective	Clean or adjust contacts.
	Open winding on relay 10	Repair or replace relay 10.
	Broken ground connection at relay 10	Check continuity of wiring and repair connection.
Incoming line lamp lights, bell does not ring.	Operated fuse in night alarm circuit	Replace fuse.
	Contacts 2–3 of relay 10 defective	Clean or adjust contacts.
	Contacts of night alarm bell defective	Clean or adjust bell contacts.
	Broken ground connection at terminal 2 on miscellaneous terminal board.	Check continuity of wiring and repair connection.
Station cannot transmit (no line-out alarm).	Operated fuse in cord circuit	Replace fuse.
	Contacts 1R–2R or 1L–2L of RING switch defective.	Clean or adjust contacts.
	Broken T or R lead in cord circuit	Check continuity and repair connection.
	Defective transmitter at station	Replace transmitter.
Line-out lamp does not light (test plug in jack).	Defective lamp	Replace lamp.
	Operated fuse in line-out alarm circuit	Replace fuse.
	Contacts 2–3 of line jack defective	Clean or adjust jack contacts.
	Contacts 1–2 of relay LO defective	Clean or adjust relay LO contacts.
	Open winding on relay 12	Repair or replace relay 12.
	Broken wire in line-out alarm circuit	Check continuity of wiring and repair connection.
Buzzer does not sound on line-out alarm	Contacts 2–3 and 4–5 on BUZZER CUT OFF KEY defective.	Clean or adjust contacts.
	Contacts 2–3 on relay 13 defective	Clean or adjust contacts.
	Buzzer contacts defective	Clean or adjust contacts.
	Broken wire in line-out alarm circuit	Check continuity of wiring and repair connection.

Symptom	Probable trouble	Correction
Cord circuit LO lamp does not light (plug in jack of line out of order).	Defective lamp	Replace lamp.
	Operated fuse in cord circuit	Replace fuse.
	Contacts 1–2 of relay P defective	Clean or adjust contacts.
	Broken ground connection at sleeve of line jack.	Check continuity and repair connection.
Cord supervisory lamp does not light (plug in jack of idle line).	Defective lamp	Replace lamp.
	Operated fuse in cord circuit	Replace fuse.
	Contacts 1–2 of relay S defective	Clean or adjust contacts.
	Broken ground connection at sleeve of line jack.	Check continuity and repair connection.
Operator cannot ring station (TALK-RING switch in RING position).	Contacts 2R–3R or 2L–3L on RING switch defective.	Clean or adjust contacts.
	Contacts 2–3 or 4–5 on RINGING TRANSFER KEY defective.	Clean or adjust contacts.
	RINGING TRANSFER KEY in HAND GEN. position.	Operate switch to POWER GEN. position.
	Failure of automatic ringer	Switch to hand generator operation until automatic ringer is repaired.
	Generator lamp defective	Replace lamp.
	Broken wire in ringing circuit	Check continuity and repair connection.
RINGING LAMP does not light when ringing current is applied to line.	Defective lamp V1	Replace lamp.
	Contacts 3R–4R on RING switch defective.	Clean or adjust contacts.
	Resistor 14 or 15 defective	Replace defective resistor.
	Broken wire in RINGING LAMP circuit	Check continuity and repair connection.
No incoming trunk signal	Defective lamp	Replace lamp.
	Defective component in trunk circuit	Test trunk circuit components and replace defective component.
	Operated fuse in trunk circuit	Replace fuse.
	Contacts 1–2 on relay 5 defective	Clean or adjust contacts.
	Broken wire in trunk circuit	Check continuity and repair connection.
Incoming trunk signal does not lock in	Contacts 5R–6R of NORMAL switch defective.	Clean or adjust contacts.
	Contacts 3–4 of relay 5 defective	Clean or adjust contacts.
	Defective resistor 6	Replace defective resistor.
	Open lockup winding on relay 5	Repair or replace relay 5.
	Broken wire in lockup circuit of relay 5	Check continuity and repair connection.
Operator cannot transmit over trunk	Contacts 1L–2L, 1R–2R, or 4R–5R of NORMAL switch defective.	Clean or adjust contacts.
	Contacts 2R–3R or 2L–3L of HOLD switch defective.	Clean or adjust contacts.
	HOLD-TALK-NORMAL switch of other trunk circuit in TALK position.	Operate switch of other trunk to HOLD or NORMAL position.
Operator cannot hold trunk call	Contacts 1L–3L of HOLD switch defective.	Clean or adjust contacts.
	Defective resistor 7	Replace defective resistor.
	Broken wire in holding bridge	Check continuity and repair connection.
Operator cannot talk to station while trunk is held.	Contacts 1R–3R or 4L–5L of HOLD switch defective.	Clean or adjust contacts.
	One or both trunk switches in TALK position.	Operate trunk switches to HOLD or NORMAL position.
Operator cannot dial	Shunt springs or impulse springs in dial defective.	Clean or adjust dial spring contacts.
	Contacts 1R–3R or relay 2 defective	Clean or adjust contacts.
	Open winding on relay 2	Repair or replace relay 2.
Operator hears clicks while dialing	Operation of relays 2 or 1 defective	Clean contacts; adjust or replace defective relay.
POWER FAILURE LAMP goes out	Defective lamp	Replace lamp.
	Batteries discharged	Check and adjust output of battery charging rectifier.

Symptom	Probable trouble	Correction
Heater circuit inoperative. (SB–55A/FTC only).	Broken wire in POWER FAILURE LAMP circuit.	Check continuity and repair connection.
	Heater switch contacts defective	Clean and adjust contacts or replace switch.
	Resistor HR1 or HR2 loose or defective	Tighten resistor in socket or replace defective resistor.
	Broken wire in heater circuit	Disconnect power source; check continuity and repair connection.

Section IV. REPAIR AND ADJUSTMENT OF RELAYS AND SWITCHES

40. General

a. Relays and switches used in Telephone Switchboard SB–55(*)/FTC do not require frequent adjustment. Continual service over a prolonged period, however, causes contact wear and loss of spring tension which makes adjustment necessary to restore the relays and switches to maximum efficiency.

b. Adjustment consists mainly of bending contact springs to meet the requirements in paragraphs 41 through 45. Mechanical requirements apply to relays and switches. Electrical requirements apply to relays only.

c. Refer to TM 11–468 for the adjustment procedure on the dial.

Note. Test requirements are used when inspecting equipment for the need of adjustment. Equipment that meets test requirements does not need adjustment. Readjust requirements (closer tolerances) must be met when equipment is adjusted.

41. Requirements and Adjustments for Lever-Type Switches

(fig. 13)

a. Lever Springs,

(1) There should be a perceptible clearance (.0025 to .004 inch) between the lever springs and the roller with the cam in the normal vertical position. Gage by eye.

(2) To correct, adjust the lever spring that rests against the roller; use duckbill pliers.

b. Contact Alinement.

(1) Contacts should line up so that the point of contact falls wholly within the boundary of the opposing contact. Gage by eye.

(2) If the contacts are not in proper alinement, loosen the spring assembly screws and shift the springs as required. Tighten the screws securely.

c. Contact Separation. The separation between any pair of open contacts should be—

Test ---------- minimum .010 inch
Readjust ---------- minimum .015 inch

d. Contact Pressure. The pressure between all closed contacts should be—

Test ---------- minimum 50 grams
Readjust ---------- minimum 55 grams

e. Contact Sequence. The normally closed contacts operated directly by a lever spring should break before the normally open contacts of the same assembly make by—

Test ---------- minimum .004 inch
Readjust ---------- minimum .005 inch

f. Spring Adjustments.

(1) Remove any foreign matter that may be wedged between springs that may interfere with spring operation; use a toothpick dipped in Cleaning Compound.

(2) Check the requirements (*c* through *e* above).

(3) To correct for contact separation and contact pressure, place the pliers on the spring where it leaves the clamping plates and adjust the spring to the right or left as required; be careful not to disturb adjacent springs.

(4) When adjusting for contact pressure and the adjustment cannot be made without bowing the spring, place the pliers on the spring, just back of the contact, and slide them back to where the spring leaves the clamping plates. Draw the pliers upward the length of the spring, meanwhile applying pressure as required.

(5) If it is necessary to further adjust the springs to meet the contact separation or contact sequence requirements, place the pliers just below the contact and bend the spring as required.

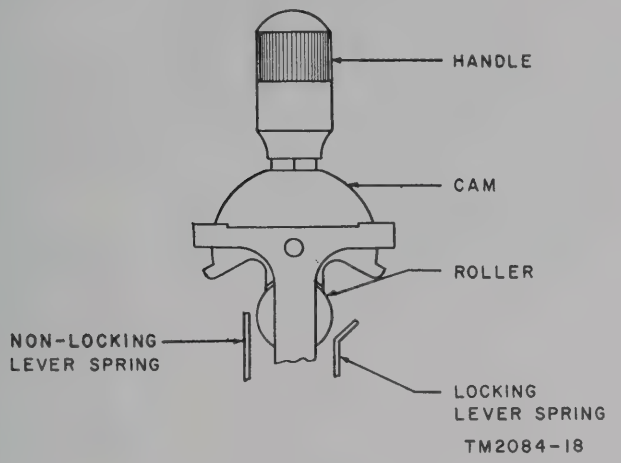


Figure 13. Lever switch.

42. Requirements and Adjustments for Turn Button Switches

(fig. 14)

a. Contact Alinement. Check and aline the contacts as described in paragraph 41*b*.

b. Plunger Spring Pressure.

(1) The pressure of the plunger springs against the plunger with the switch in the unoperated position should be—

Test ..... minimum 50 grams
Readjust ..... minimum 80 grams

(2) With the plunger in position in the switch shell, turn it slightly; note that its springs move with the slightest twisting motion. If it is possible to twist the plunger without moving the springs, it is an indication that the plunger springs do not rest against the plunger. Remove the plunger to determine whether or not the springs are shaped approximately the same. Bend the springs as required with the pliers until they have the same profile. Replace the plunger between the springs.

c. Contact Pressure. The pressure between all closed contacts should be—

Test ..... minimum 75 grams
Readjust ..... minimum 80 grams

d. Contact Sequence. The normally closed contacts should break before the normally open contacts make by—

Test ..... minimum .005 inch
Readjust ..... minimum .007 inch

e. Spring Adjustments. To correct contact separation and contact pressure, adjust the springs as described in paragraph 41*f*.

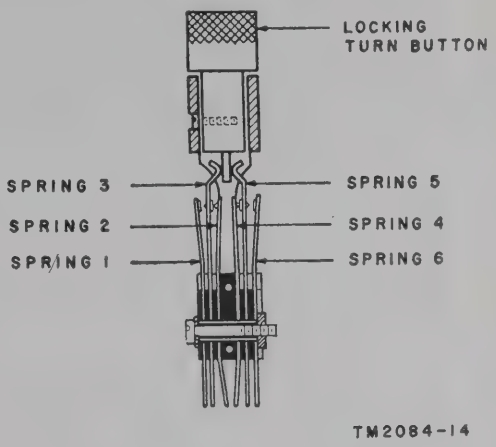


Figure 14. Turn button switch.

43. Relay Identification

a. Two types of relays are used in the circuits of Telephone Switchboard SB–55(*)/FTC. Type 2000 (fig. 15) is a conventional telephone relay. Its springs are adjusted with spring bending tools. Type 2100 (fig. 16) is provided with adjusting screws for the individual springs. The type number is stamped on the heelpiece of each relay. Refer to the wiring diagram (fig. 21) for contact numbering and winding terminal designations.

b. The chart below lists the relays of each type used. The mechanical and electrical requirements for all the relays in the SB–55(*)/FTC are shown in figure 17.

Type 2000 relays	Type 2100 relays
A	LO
ER	P
1	S
2	10
5	13

44. Type 2000 Relays

(fig. 15)

a. Armature Adjustments. The range of lever spring and armature movement is determined primarily by armature spacing which should be checked before making spring adjustments. Decreasing this space will strengthen armature pull, but it will decrease lever movement. Armature

adjustments of this kind are seldom required except to compensate for changes in residual height which may be made to overcome a developing residual magnetism. The distance between the end of a residual pin or screw and the pole piece is measured with a leaf gage. If changing is necessary, remove the armature and bend it slightly at the angle. Use two pairs of pliers and apply pressure evenly to avoid twisting the two wings out of line at the angle. When replacing the armature, turn down the adjusting nut until the armature just begins to move. Then back the nut off slightly so that the armature moves freely without binding and yet fits closely enough to the end of the heelpiece to avoid play. The upper end then should lie flat on the heelpiece without locking.

b. Residual Screws. Residual screws (fig. 16) may need readjustment to insure prompt release of a relay or to compensate for wear. A high screw increases speed of release while a low screw decreases it. If armature spacing has to be changed, make residual screw readjustments with a screwdriver and open-end wrench. To determine the height of the screw, hole the armature against the pole piece and measure the distance with a leaf gage.

c. Spring Adjustments.

(1) *Adjusting spring tension.* Spring tension requirements are shown in terms of gram pressure in the relay adjusting table (fig. 17). These pressures may be increased to meet specified requirements. Make the tension tests by applying the gram gage as near as possible to the contact of the spring being tested. The spring should not break contact before its required gram pressure is indicated on the gage. To change spring tension, use a relay spring bender applied to the spring at the point where it leaves the clamping plates.

(2) *Straightening and positioning springs.* If the spring is not straight or if there is not enough separation between springs, correct the condition by adjusting the spring where it is distorted. However, a slight bow in the spring is permissible when needed to secure proper contact adjustment. The following requirements apply to all spring combinations.

(*a*) A break contact should rest solidly with the prescribed tension on its stop, and it should not follow the lever spring when the relay operates.

(*b*) A make contact should rest solidly on its stop with the prescribed tension and should not follow or lift from the stop more than .003 to .005 inch after the lever spring makes contact.

(*c*) There should be a minimum of .005-inch separation between any pair of open contacts and at least the same separation along the entire length of any pair of adjacent springs.

(*d*) The lever spring should rest with the prescribed tension against a break contact, with a separation of at least .002 inch from the armature stop. When there is no break contact, the lever spring should rest on the armature stop. The lever spring must move from a minimum of .005 inch to a maximum of .015 inch when the relay operates.

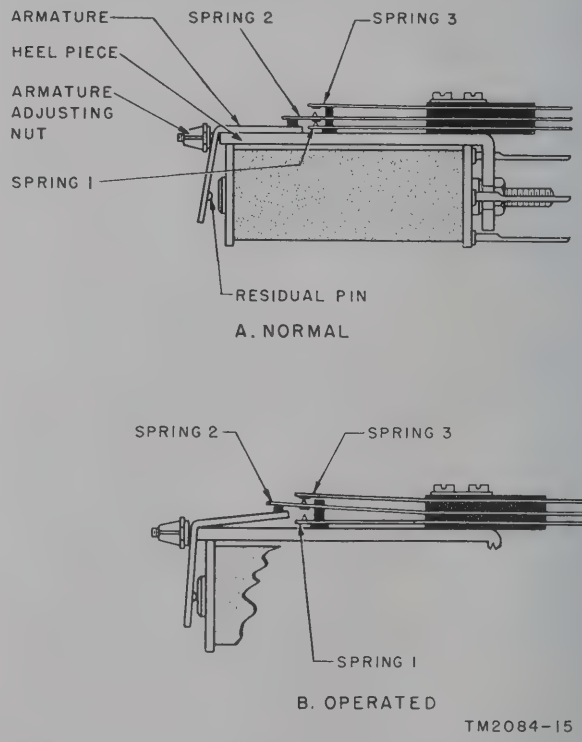


Figure 15. Type 2000 relay.

45. Type 2100 Relays

(fig. 16)

a. Spring Design. The spring assembly and the method of adjustment of the type 2100 relays differ from that of the 2000 type relay. Each

spring has a bent projection A′, B′, or C′ which comes into contact with the corresponding adjusting screw A, B, or C. The projection A′ is bent downward; therefore turning screw A in a clockwise direction increases the tension and lowers the contact end of the spring. The projections on the other two springs are bent upward. Turning screws B and C in a clockwise direction decreases the tension and raises the corresponding spring.

b. Adjusting. If the relay does not operate on its test value, lower the tension on the lever spring by turning adjusting screw A slightly in a counterclockwise direction. When this adjustment is made, it may be necessary to increase the air gap to provide correct spacing when the contacts are open. Increase the air gap by turning screw B in a clockwise direction. Refer to paragraph 44*c*(2) for the requirements on contact spacing and follow.

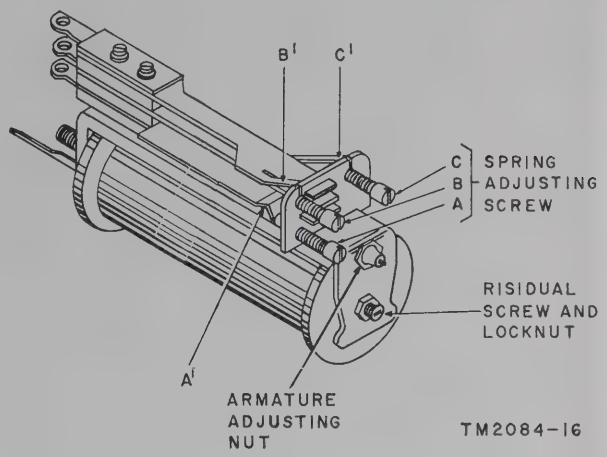


Figure 16. Type 2100 relay.

REF SYMBOL	COIL RESISTANCE IN OHMS	MECHANICAL REQUIREMENTS			AFTER SOAK	DIRECT CURRENT FLOW IN AMPERES						REMARKS
						TEST			READJUST			
		CONT PRESSURE IN GRAMS	ARM. TRAVEL	RESIDUAL HEIGHT		OPERATE	NON OPERATE	RELEASE	OPERATE	NON OPERATE	RELEASE	
ER	500 2000		0.020			0.030	0.0115		0.028	0 012		
LO	70		0.010		0.029	0 010		0.0025	0.0095		0.003	
A	1 000 1 000	20	0.020			0 034			0.014			
P	70		0.010		0.150	0.010		0.0025	0.0095		0.003	
S	35		0.015	0.010	0.150	0.035		0.014	0.034		0.015	
1	1000	20	0.020			0.034			0.007			
2	1000	20	0.020			0.034			0.015			
5	1000 310		0.020	0.012		0.014	0.009		0.013	0.010		TOP SPRING 0.010 TO 0.015G
10	3.5		0.010		0.150	0.037		0.0015	0.022		0.002	
16	1500	20	0.020			0.027			0.005			
13	3.5		0.010		0.150	0.037		0 0015	0.022		0 002	

NOTES:
1. USE READJUST CURRENT FOR INITIAL ADJUSTMENTS.
2. USE TEST CURRENT FOR ROUTINE CHECKING AND INSPECTION.
3. USE READJUST VALUES IF RELAYS FAIL TO MEET TEST REQUIREMENTS.
4. APPLY SOAK CURRENT WHEN SPECIFIED BEFORE TESTING OR READJUSTING.

TM2084-41

Figure 17. Relay adjusting table.

Section V. REMOVAL AND REPLACEMENT OF PARTS

46. General

Most of the components of Telephone Switchboard SB–55(*)/FTC are accessible when the relay gate is opened (fig. 18). The remaining components can be reached when the keyshelf is raised (fig. 19). All components are stamped with the reference symbol and circuit number.

a. Before replacing an electrical component, be sure that the part being installed is identical with the part being replaced. Check the number stamped on the new part against the number stamped on the replaced part.

b. Replace defective resistors, capacitors, and coils. It is not practical for maintenance personnel to repair these items. Before replacing a resistor or coil, eheck its resistance against the value shown on the schematic diagram (fig. 20).

c. Relays may be readjusted (pars. 44 and 45), but they should be replaced if spring separation of contacts cannot be maintained, windings become open or shorted, or terminals or springs are broken.

Caution: All components are removable with the use of common handtools. Maintenance per-

sonnel, however, must be very careful not to damage wiring and adjacent equipment when removing or replacing any component. Always use a cloth to shield adjacent equipment when unsoldering and soldering. Always check for loose connections and shorted terminals when soldering operations are completed. Always select the correct size socket wrench when removing and replacing mounting nuts. Be particularly careful when removing and replacing jacks and lamp strips in the face equipment. Failure to observe proper precautions can result in the introduction of troubles into working circuits.

47. Removal and Replacement of Gate-Mounted Components

(fig. 18)

a. Unsolder and tag the wires for identification.

b. Select the proper size socket wrench to remove and replace the mounting nuts. Do not use pliers. Do not overtighten mounting nuts. Overtightening may strip the thread or shear off the mounting bolt.

c. After mounting and connecting new components, dress the wiring to prevent shorted terminals.

48. Removal and Replacement of Jacks and Lamp Strips

(fig. 4)

a. Loosen, but do not remove, the jack fastening bolts at each end of the strips to be removed. Use the socket wrench with the 18½-inch long handle.

b. Withdraw the strips carefully toward the rear of the switchboard. One jack strip and two lamp strips (10 circuits) are wired from one arm of the cable form. The three strips will come out as a unit. The slack in the wiring from the cable arm to the jacks will permit bringing the strips to the rear of the adjacent cable arms. The cable arm may be bent where it leaves the main cable form.

c. Tie the strips to adjacent cable arms to hold them securely when unsoldering. Protect adjacent equipment with cloth to prevent solder splashing. As the wires are unsoldered, tag each lead or group of leads for identification when the new strip is connected.

d. When connecting new strips, maintain the original skinner length.

e. Before replacing the jacks and lamp strips, loosen the jack fastening bolts above and below the strips to be replaced. This will permit some movement and prevent binding as the strips are replaced.

f. When replacing the strips, feed the ends nearest the cable form into the vacant space in the jack field. Push firmly forward and to the right until the strips rest against the stop. Push the left ends of the strips forward until they are caught by the flanges on the jack fastening bolts.

g. Tighten the jack fastening bolts snugly and dress the wires neatly.

49. Removal and Replacement of Keyshelf Components

(fig. 19)

a. Switches.

(1) Raise the keyshelf, loosen the switch mounting screws, and shift the butterfly so that the switch can be removed. Push the switch slightly upward.

(2) Lower the keyshelf. Grasp the switch by its handle and raise it out of the keyshelf as far as the slack in the wire will permit.

(3) Tag each lead as the wires are unsoldered for identification when reconnecting.

(4) Before connecting the new switch, examine the old switch for strapped terminals. Arrange strapping on the new switch exactly as it was on the old one before connecting the wires to the new switch.

(5) Fold the skinners in a loop and insert them and the new switch into the keyshelf.

(6) Raise the keyshelf, fasten the butterflies, tighten the switch mounting screws snugly, and dress the wires neatly.

b. Supervisory Lamps. The removal of one retaining screw will permit the lamp holders to be removed from the underside of the keyshelf.

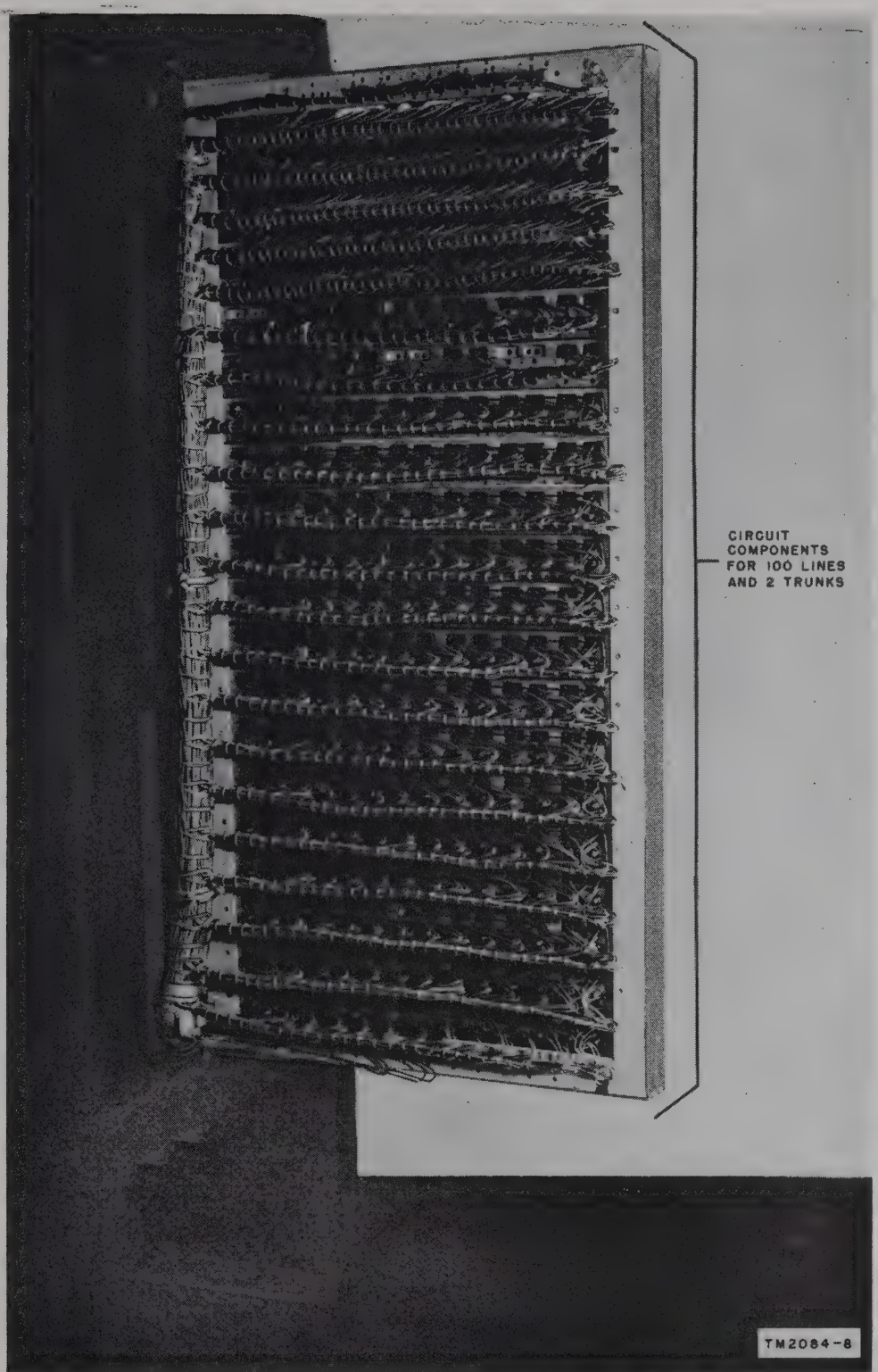


Figure 18. Telephone Switchboard SB–55(*)/FTC, showing wiring side of gate mounted components.

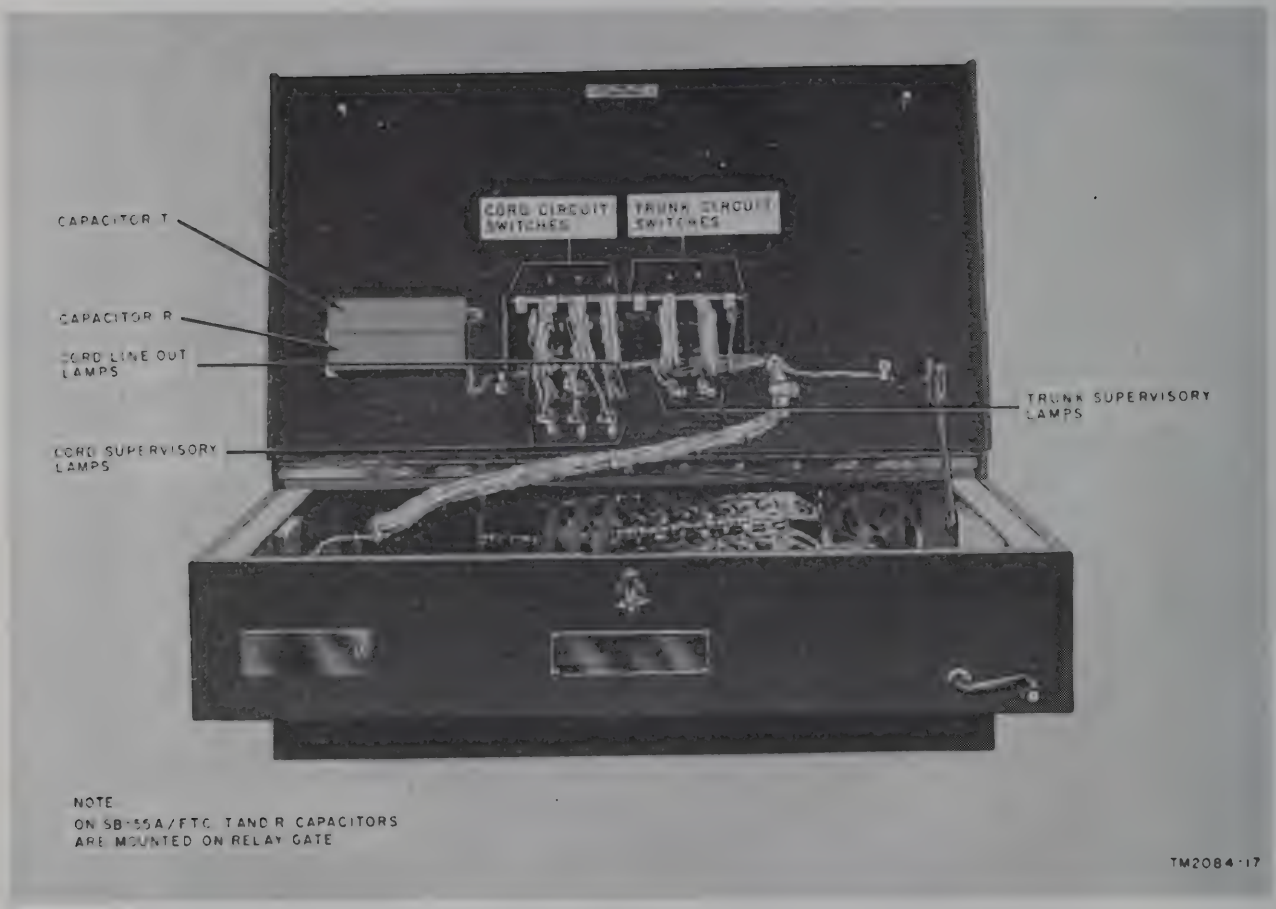
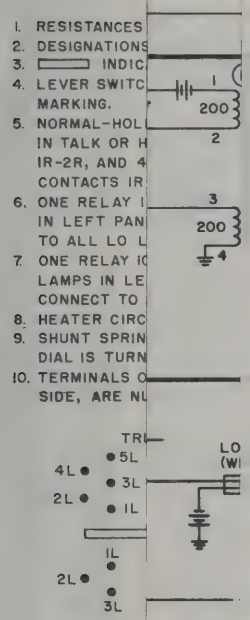


Figure 19. Telephone Switchboard SB–55/FTC, underside of keyshelf.


1. RESISTANCES
2. DESIGNATIONS
3. INDIC
4. LEVER SWITC
MARKING.
5. NORMAL-HOL
IN TALK OR H
IR-2R, AND 4
CONTACTS IR
6. ONE RELAY I
IN LEFT PAN
TO ALL LO L
7. ONE RELAY IC
LAMPS IN LE
CONNECT TO
8. HEATER CIRC
9. SHUNT SPRIN
DIAL IS TURN
10. TERMINALS O
SIDE, ARE NU
1
200
2
3
200
4
TR
5L
LO
(WI
4L
3L
2L
1L
1L
2L
3L
11. RELAY TERM
NUMBERED A
ACTUA
CIRCUIT
3R
2R
1R
BUZZER
T OFF KEY
1
2
3
6
4
5

matic dia

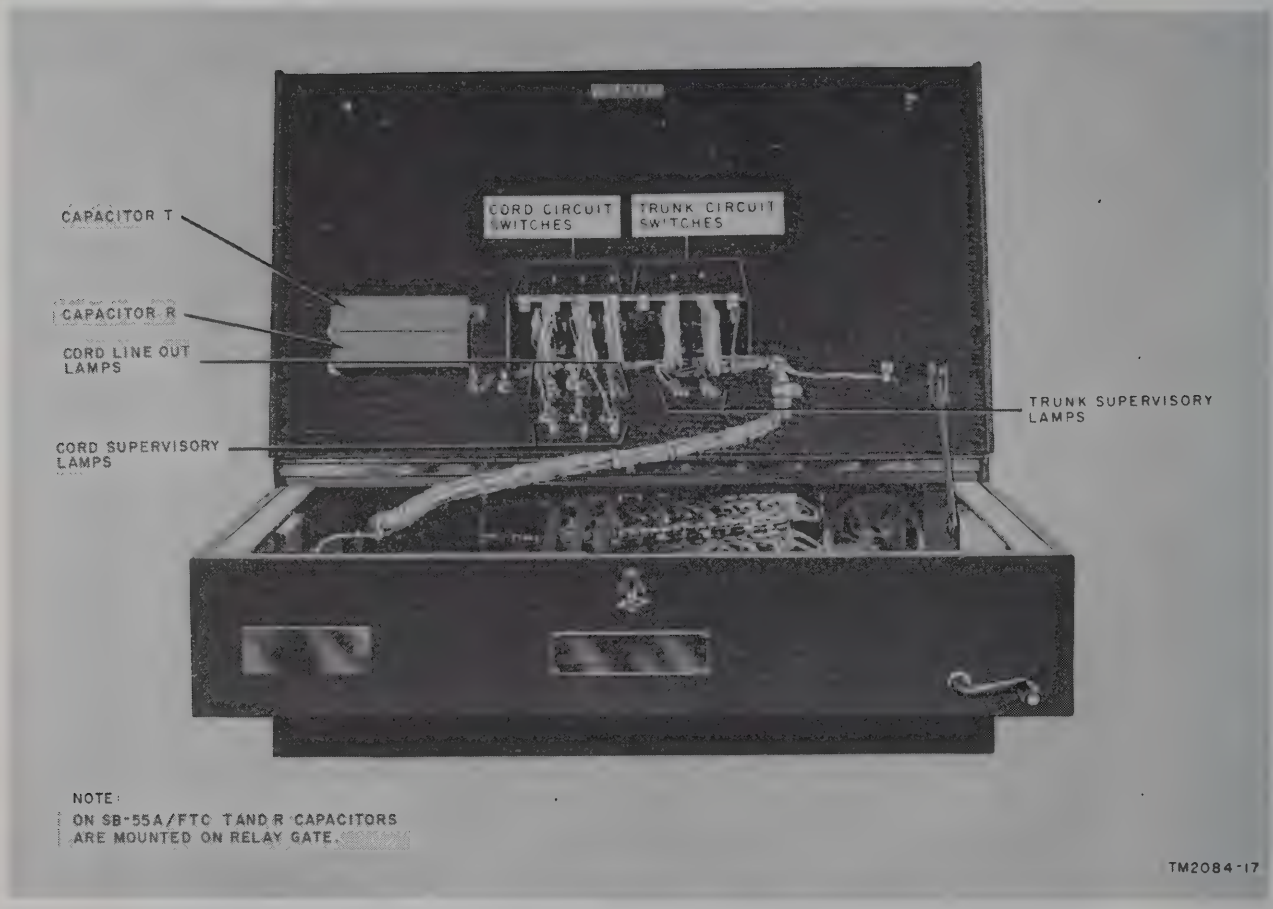


Figure 19. Telephone Switchboard SB–55/FTC, underside of keyshelf.

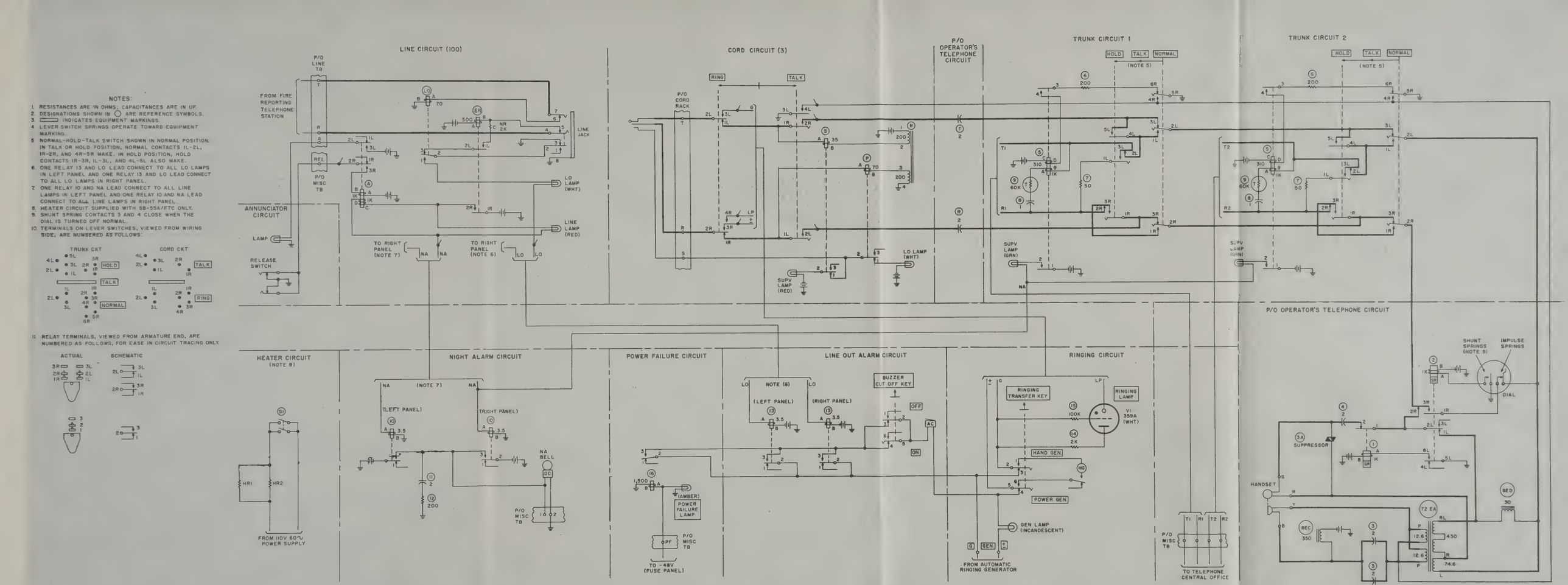
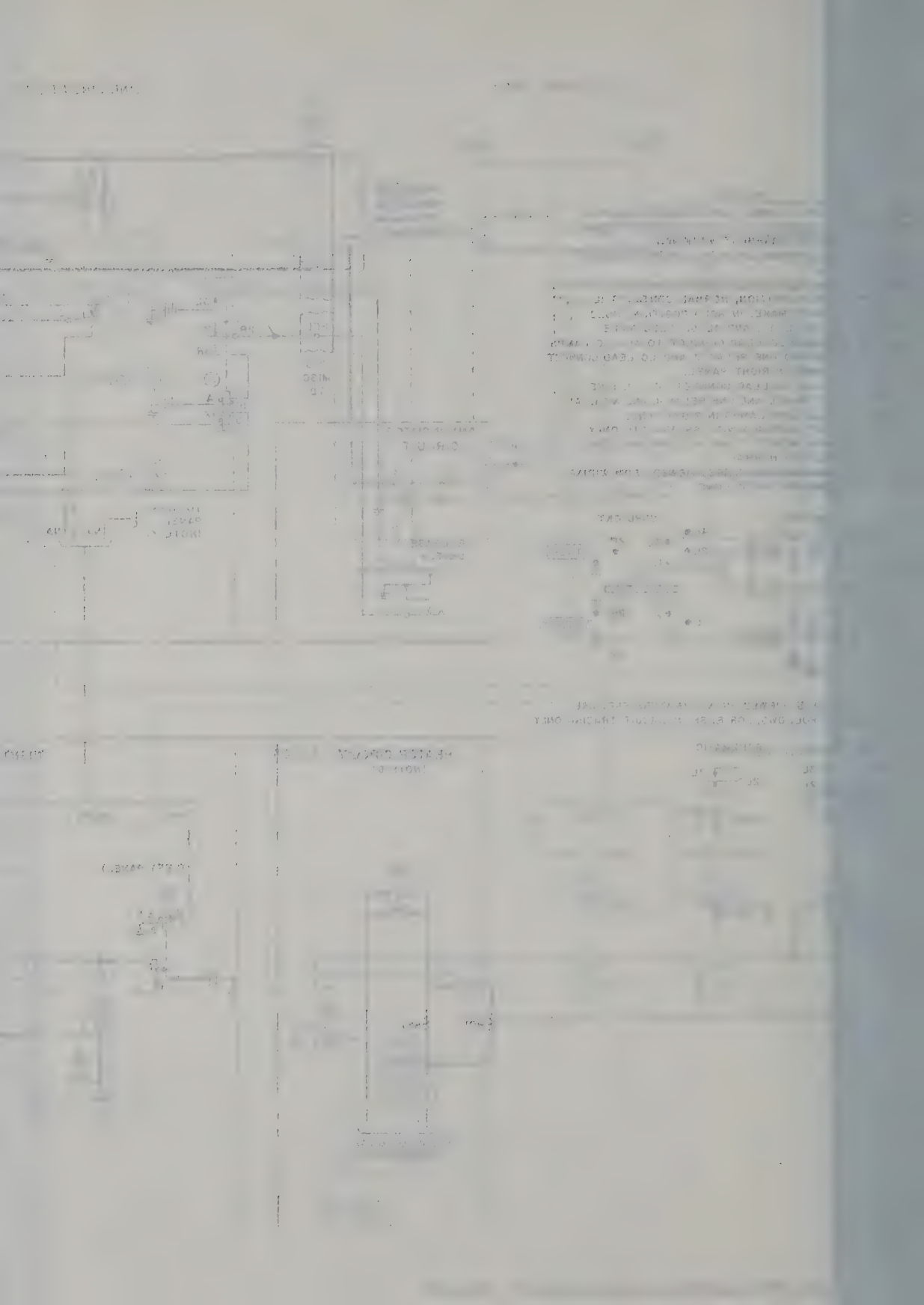
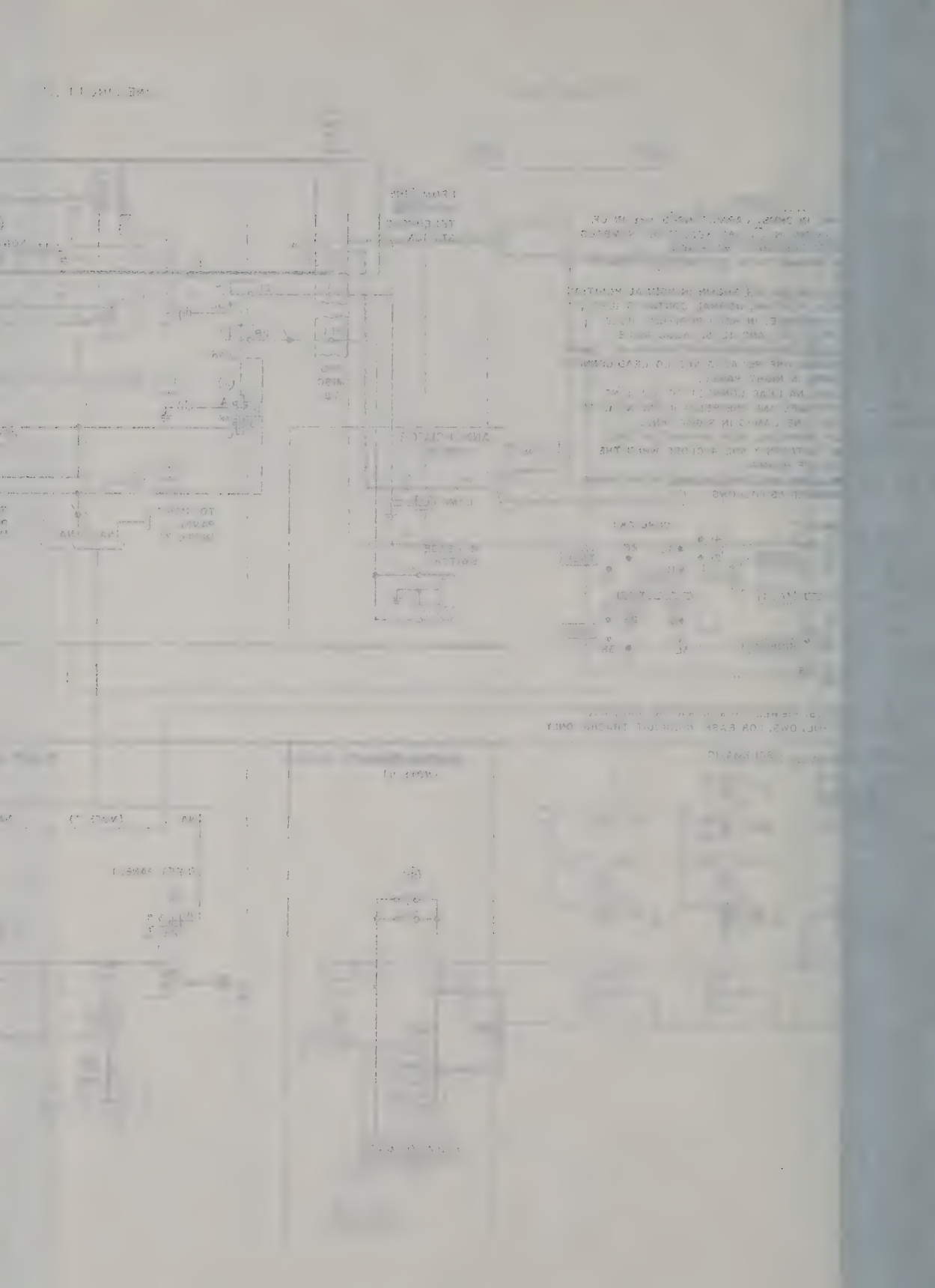

NOTES:
1. RESISTANCES ARE IN OHMS; CAPACITANCES ARE IN UF.
2. DESIGNATIONS SHOWN IN ◯ ARE REFERENCE SYMBOLS.
3. ▭ INDICATES EQUIPMENT MARKINGS.
4. LEVER SWITCH SPRINGS OPERATE TOWARD EQUIPMENT MARKING.
5. NORMAL-HOLD-TALK SWITCH SHOWN IN NORMAL POSITION. IN TALK OR HOLD POSITION, NORMAL CONTACTS 1L-2L, 1R-2R, AND 4R-5R MAKE. IN HOLD POSITION, HOLD CONTACTS 1R-3R, 1L-3L, AND 4L-5L ALSO MAKE.
6. ONE RELAY 13 AND LO LEAD CONNECT TO ALL LO LAMPS IN LEFT PANEL AND ONE RELAY 13 AND LO LEAD CONNECT TO ALL LO LAMPS IN RIGHT PANEL.
7. ONE RELAY 10 AND NA LEAD CONNECT TO ALL LINE LAMPS IN LEFT PANEL AND ONE RELAY 10 AND NA LEAD CONNECT TO ALL LINE LAMPS IN RIGHT PANEL.
8. HEATER CIRCUIT SUPPLIED WITH SB-55A/FTC ONLY.
9. SHUNT SPRING CONTACTS 3 AND 4 CLOSE WHEN THE DIAL IS TURNED OFF NORMAL.
10. TERMINALS ON LEVER SWITCHES, VIEWED FROM WIRING SIDE, ARE NUMBERED AS FOLLOWS:
TRUNK CKT
CORD CKT
HOLD
TALK
NORMAL
RING
11. RELAY TERMINALS, VIEWED FROM ARMATURE END, ARE NUMBERED AS FOLLOWS, FOR EASE IN CIRCUIT TRACING ONLY.
ACTUAL
SCHEMATIC
LINE CIRCUIT (100)
P/O LINE TB
FROM FIRE REPORTING TELEPHONE STATION
LINE JACK
P/O MISC TB
LO LAMP (WHT)
LINE LAMP (RED)
ANNUNCIATOR CIRCUIT
LAMP
RELEASE SWITCH
TO RIGHT PANEL (NOTE 7)
TO RIGHT PANEL (NOTE 6)
CORD CIRCUIT (3)
P/O CORD RACK
RING
TALK
SUPV LAMP (RED)
LO LAMP (WHT)
P/O OPERATOR'S TELEPHONE CIRCUIT
TRUNK CIRCUIT 1
TRUNK CIRCUIT 2
HOLD
TALK
NORMAL
(NOTE 5)
SUPV LAMP (GRN)
HEATER CIRCUIT (NOTE 8)
FROM 110V 60~ POWER SUPPLY
NIGHT ALARM CIRCUIT
(LEFT PANEL)
(RIGHT PANEL)
NA BELL
POWER FAILURE CIRCUIT
(AMBER) POWER FAILURE LAMP
TO -48V (FUSE PANEL)
LINE OUT ALARM CIRCUIT
NOTE (6)
BUZZER CUT OFF KEY
OFF
AC
ON
RINGING CIRCUIT
RINGING TRANSFER KEY
RINGING LAMP
VI 359A (WHT)
HAND GEN
POWER GEN
GEN LAMP (INCANDESCENT)
FROM AUTOMATIC RINGING GENERATOR
TO TELEPHONE CENTRAL OFFICE
P/O OPERATOR'S TELEPHONE CIRCUIT
SHUNT SPRINGS (NOTE 9)
IMPULSE SPRINGS
DIAL
SUPPRESSOR
HANDSET
TM2084-50

Figure 20. Telephone Switchboard SB-55A/FTC, schematic diagram.





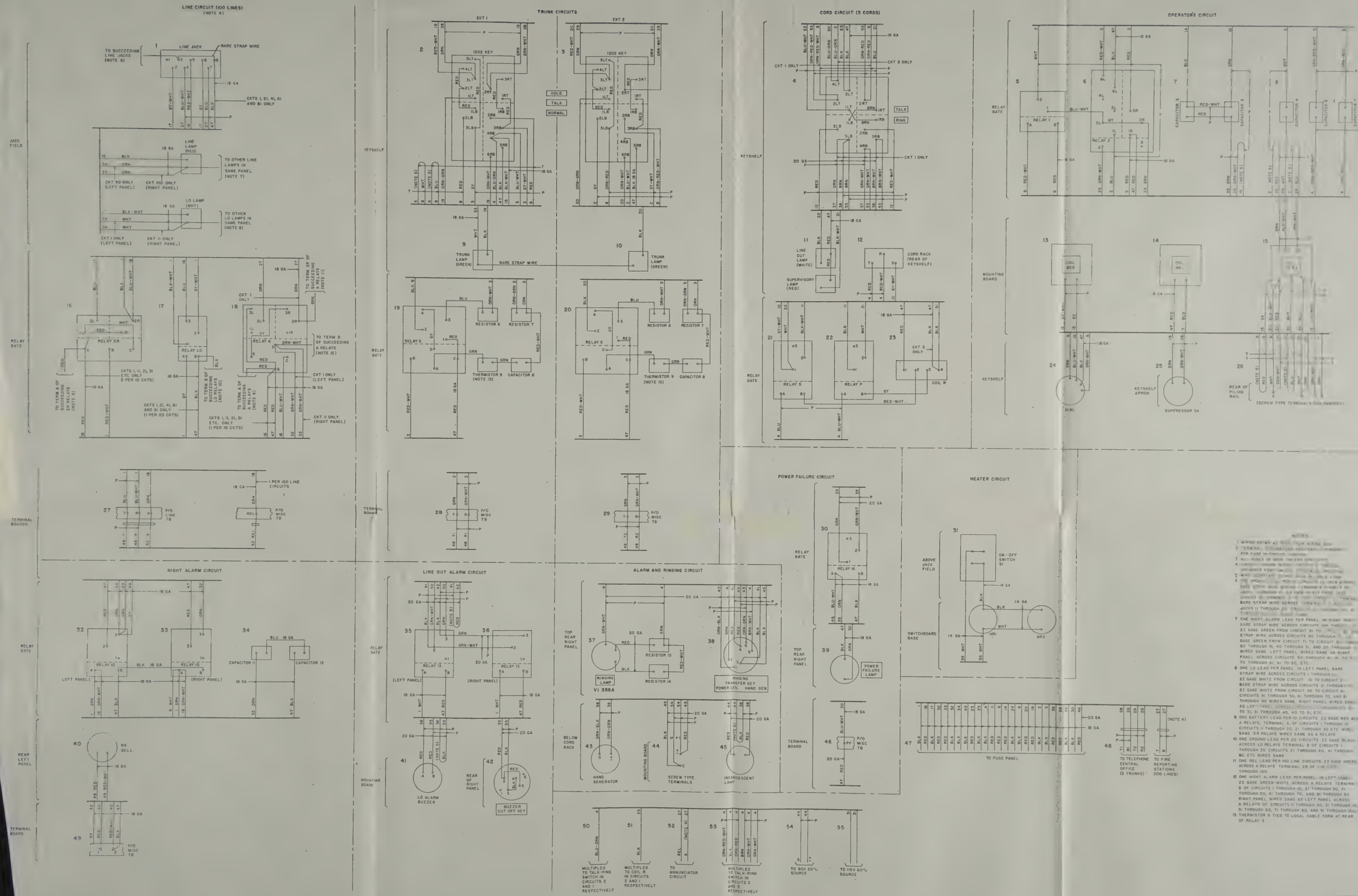
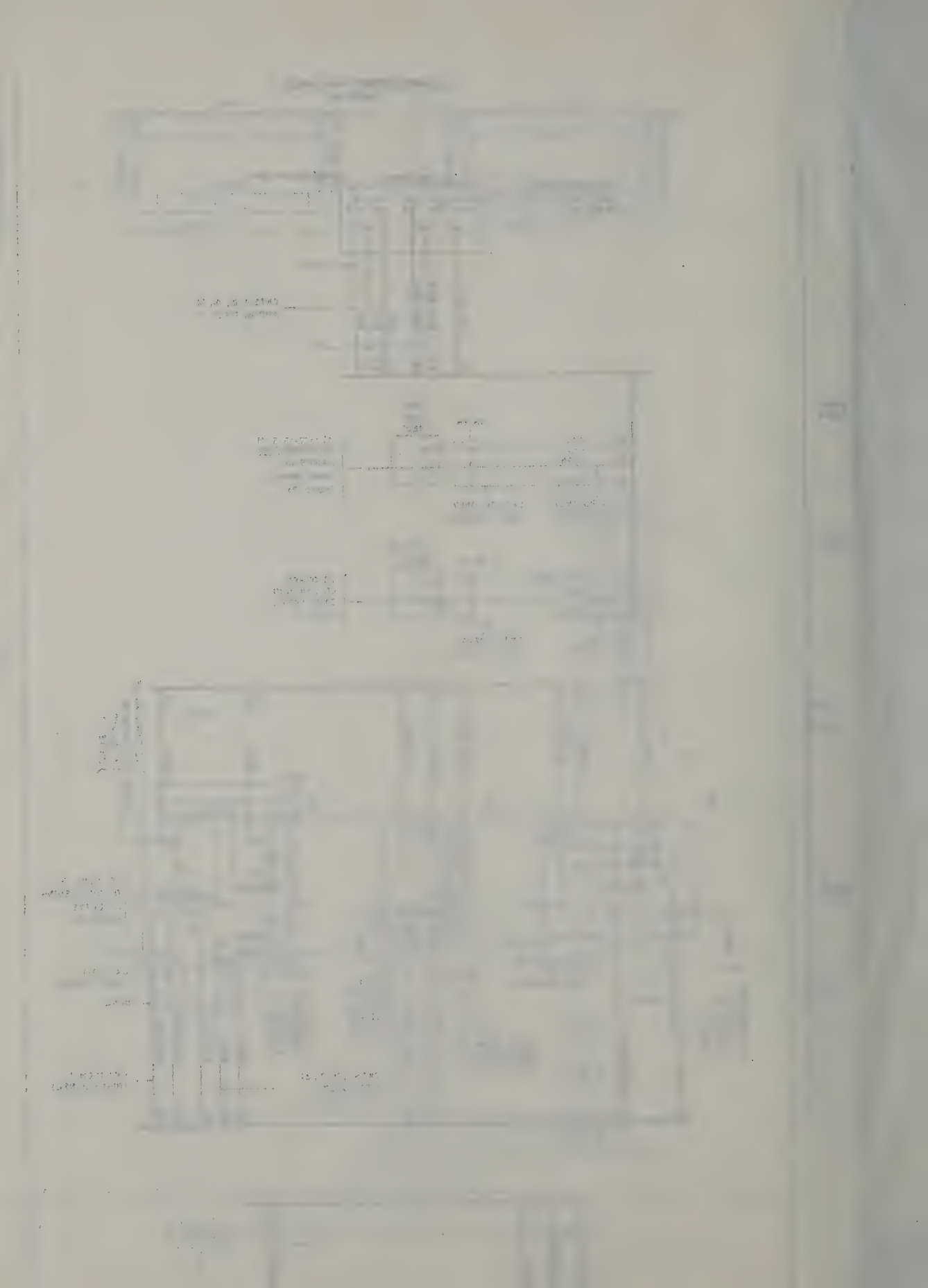

LINE CIRCUIT (100 LINES)
(NOTE 4)
JACK FIELD
RELAY GATE
TERMINAL BOARDS
TRUNK CIRCUITS
KEYSHELF
RELAY GATE
MOUNTING BOARD
CORD CIRCUIT (3 CORDS)
KEYSHELF
RELAY GATE
OPERATOR'S CIRCUIT
RELAY GATE
MOUNTING BOARD
KEYSHELF
TERMINAL BOARD
POWER FAILURE CIRCUIT
RELAY GATE
HEATER CIRCUIT
ABOVE JACK FIELD
SWITCHBOARD BASE
NIGHT ALARM CIRCUIT
RELAY GATE
REAR LEFT PANEL
TERMINAL BOARD
LINE OUT ALARM CIRCUIT
RELAY GATE
MOUNTING BOARD
ALARM AND RINGING CIRCUIT
TOP REAR RIGHT PANEL
BELOW CORD RACK
MOUNTING BOARD
NOTES
1 WIRING SHOWN AS SEEN FROM WIRING SIDE
2 TERMINAL NUMBERING AS SEEN FROM REAR OF EQUIPMENT
3 NUMBERS OF WIRES AND CABLES INDICATED
4 CONNECTIONS SHOWN FOR ONE CIRCUIT
5 WIRE COLOR AS INDICATED
6 ONE LINE LAMP LEAD PER LINE CIRCUIT 22 GAGE BLACK FROM CIRCUIT 1 TO CIRCUIT 100 ACROSS LINE LAMPS IN JACKS 1 THROUGH 20 CIRCUITS 21 THROUGH 40, 41 THROUGH 60, ETC WIRED SAME
BARE STRAP WIRE ACROSS
JACKS 11 THROUGH 20 CIRCUITS
7 ONE NIGHT ALARM LEAD PER PANEL IN RIGHT
BARE STRAP WIRE ACROSS CIRCUITS
22 GAGE GREEN FROM CIRCUIT 91 TO
STRAP WIRE ACROSS CIRCUITS 80 THROUGH
GAGE GREEN FROM CIRCUIT 71 TO CIRCUIT 80
60 THROUGH 51, 40 THROUGH 31, AND 20 THROUGH
WIRED SAME. LEFT PANEL WIRED SAME AS RIGHT
PANEL ACROSS CIRCUITS 90 THROUGH 81 81 TO 7
70 THROUGH 61, 61 TO 50, ETC
8 ONE LO LEAD PER PANEL IN LEFT PANEL BARE
STRAP WIRE ACROSS CIRCUITS 1 THROUGH 11
22 GAGE WHITE FROM CIRCUIT 10 TO CIRCUIT 2
BARE STRAP WIRE ACROSS CIRCUITS 21 THROUGH
22 GAGE WHITE FROM CIRCUIT 30 TO CIRCUIT 41
CIRCUITS 41 THROUGH 50, 61 THROUGH 70, AND 81
THROUGH 90 WIRED SAME. RIGHT PANEL WIRED SAME
AS LEFT PANEL
TO 31, 31 THROUGH 40, 40 TO 51, ETC
9 ONE BATTERY LEAD PER 10 CIRCUITS 22 GAGE RED ACROSS
A RELAYS, TERMINAL A, OF CIRCUITS 1 THROUGH 10
CIRCUITS 11 THROUGH 20, 21 THROUGH 30 ETC WIRE
SAME ER RELAYS WIRED SAME AS A RELAYS
10 ONE GROUND LEAD PER 20 CIRCUITS 22 GAGE BLACK
ACROSS LO RELAYS TERMINAL B OF CIRCUITS 1
THROUGH 20 CIRCUITS 21 THROUGH 40, 41 THROUGH
60, ETC WIRED SAME
11 ONE REL LEAD PER 100 LINE CIRCUITS 22 GAGE GREEN
ACROSS A RELAYS TERMINAL 2B OF CIRCUITS
THROUGH 100
12 ONE NIGHT ALARM LEAD PER PANEL IN LEFT
22 GAGE GREEN-WHITE ACROSS A RELAYS TERMINAL
D OF CIRCUITS 1 THROUGH 10, 21 THROUGH 30, 41
THROUGH 50, 61 THROUGH 70, AND 81 THROUGH 90
RIGHT PANEL WIRED SAME AS LEFT PANEL ACROSS
A RELAYS OF CIRCUITS 11 THROUGH 20, 31 THROUGH 40,
51 THROUGH 60, 71 THROUGH 80, AND 91 THROUGH 100
13 THERMISTOR 9 TIED TO LOCAL CABLE FORM AT REAR
OF RELAY 5
TM2084

Figure 21. Telephone Switchboard SB-55A/FTC, wiring diagram.



CHAPTER 5
THEORY

50. General

a. The SB–55(*)/FTC provides terminating facilities at a fire reporting headquarters for 100 remote fire reporting stations and two trunks from the main telephone switchboard. The circuits provide two-way communication with the operator, but no switching facilities are provided to interconnect stations or trunks.

b. The operator's circuit is connected to the station lines by single-ended cords which are inserted into the line jacks and by the operation of lever switches. The trunks are connected to the operator's circuit through the operation of a lever switch only.

c. When installed with the additional equipment required for its operation (par. 7), the SB–55(*)/FTC becomes the major component of a telephone fire reporting system (fig. 2).

d. In addition to the line and trunk circuits, the SB–55(*)/FTC includes night alarm, line-out alarm, ringing alarm, power failure, and battery distribution circuits. A heater circuit is included in the SB–55A/FTC only. Figure 20 is the schematic diagram of the switchboard circuits.

51. Line Circuit

(fig. 20)

a. Line-Out Feature. Because of the critical nature of fire reporting circuits, a line-out feature which brings in an alarm if the line becomes open, is included in the line circuit.

(1) At the time of installation, a variable resistor at the station telephone is adjusted to provide a total line loop resistance of 3,800 ohms. A current flow of approximately 12 milliamperes in the line loop, which is higher than the operate value of relay LO (line out) and lower than the operate value of relay ER (emergency reporting), keeps relay LO operated while the line is idle. The circuit is from battery through the winding of relay ER, over the R side of the line, through the variable resistor at the telephone, over the T side of the line, and through the winding of relay LO to ground.

(2) If the line becomes open, relay LO releases, completing a circuit from ground through contacts 3–2 of the line jack, contacts 2–1 of relay LO, the LO lamp, and relay 13 to battery in the line-out alarm circuit. The LO lamp lights and relay 13 operates completing an ac circuit from the ringer through the LO alarm buzzer, the BUZZER CUT OFF KEY, contacts 3–2 of relay 13, and back to the ringer. The buzzer sounds and may be silenced by operating the BUZZER CUT OFF KEY.

(3) If the line becomes shorted, relay ER operates in series with relay LO, lighting the line lamp and giving a false indication of an incoming call.

b. Incoming Call.

(1) When an emergency reporting station originates a call, the telephone hookswitch connects the low resistance transmitter circuit in parallel with the high resistance bridge at the telephone. This decreases the total line loop resistance and increases the current flow in the line. The increased current in the line operates relay ER in series with relay LO.

(2) Relay ER locks operated from battery through both of its windings in series to ground at contact 3 of the line jack. Contacts 1R–2R complete a parallel circuit from battery, through the line lamp and through the C–D winding of relay A (annunciator) to ground, through the winding of relay 10 in the night alarm circuit. The line lamp lights, relay A operates, relay 10 operates, and the night alarm bell rings.

(3) Relay 10, when operating, completes a circuit to the self-interrupting night alarm bell. Capacitor 11 and resistor 12 act as a filter to keep the noise generated by the bell contacts from entering the transmission circuit.

(4) Relay A locks operated from battery through its A–B winding and contacts 3R–2R to ground at the annunciator release switch. Contacts 3L–2L complete a circuit to light the annunciator lamp. The locking circuit of relay A can be released only by the manual operation of the annunciator release switch.

(5) When the operator inserts a cord plug into the line jack the line loop is transferred from the line circuit relays to the cord circuit. Break contacts in the line jack open the circuit to relays ER and LO which release. Relay 10 in the night alarm circuit also releases and the night alarm bell stops ringing. Relay A remains operated under the control of the annunciator release switch.

c. Outgoing Call.

(1) Inserting a cord plug into the jack of an idle line opens the circuit of the normally operated relay LO which releases. Break contacts in the jack prevent a false line-out alarm.

(2) Relays ER and A do not operate on outgoing calls.

(3) Relay LO will reoperate as soon as the cord plug is removed from the jack at the completion of the call.

52. Cord Circuit

(fig. 20)

The cord circuit consists of a single-ended cord, a TALK RING switch, a supervisory lamp (red), a line-out lamp (white), relay P, relay S, and retardation coil R.

a. Transmission Battery. When a cord plug is inserted into a line jack, the line circuit relays are disconnected from the line and transmission battery for the reporting telephone is provided to the line through the cord circuit. The circuit is from the battery through the windings of coil R, the windings of relays P and S, normal contacts of the RING switch, the T and R of the cord and the jack, to the line.

b. Line Idle (High Resistance Bridge at Reporting Station). Relay P, which has a very low operate value, operates in series with the high resistance of the line. The supervisory lamp (red) lights from ground on the sleeve of the jack through contacts 2–1 of relay S. Relay S does not operate in series with the high resistance of the line.

c. Ringing. With the TALK-RING switch in the RING position, transmission battery is removed from the line and 20-cycle ringing current is applied to signal the called station.

d. Called Station Answers.

(1) The high resistance at the station is shunted by the low resistance transmitter.

(2) The increased current flow through relay S and the line loop operates relay S. The supervisory lamp (red) goes out.

e. Transmission Circuit. With the TALK-RING switch in the TALK position, the emergency reporting station is capacitively coupled to the operator through the T and R capacitors in the operator's circuit. High impedance coil R keeps the voice currents out of the battery. Ground for the operator's transmission battery is provided through switch contacts 3L–4L.

f. Line-Out Feature.

(1) When a cord plug is inserted into the jack of an open line (par. 51*a*), break contacts of the jack remove ground from the LO lamp of the line circuit and causes it to go out. Relay 13 in the line-out alarm circuit is also released.

(2) Because the line is open, relays P and S in the cord circuit do not operate. The supervisory and line-out lamps in the cord circuit both light from ground on the sleeve of the jack. This transfers the visual indication of a line out of service to the cord circuit.

(3) The line-out lamp will go out when the line trouble is repaired.

53. Trunk Circuit

(fig. 20)

This circuit provides automatic signaling to the post switchboard and is a ringdown trunk incoming to the SB–55(*)/FTC.

a. Incoming Call.

(1) Ringing current over the T and R of the trunk from the post switchboard through the A–B winding of relay 5, thermistor 9, and dc blocking capacitor 8 operates relay 5.

Note. The thermistor prevents false operation of relay 5. It has a high resistance to low voltage. When ringing current is applied to the thermistor, its internal resistance decreases rapidly, passing enough current to operate relay 5.

(2) Relay 5 locks operated through its C–D winding and current limiting resistor 6 to ground at the HOLD-TALK-NORMAL switch. Contacts 1–2 complete a circuit from battery through the supervisory lamp, and relay 10 in the night alarm circuit to ground. The trunk lamp lights, relay 10 operates, and the night alarm bell rings.

(3) When the HOLD-TALK-NORMAL switch is operated to the TALK position, relay 5 releases, the supervisory lamp goes out, relay 10 in the night alarm circuit releases, and the night alarm bell stops ringing.

(4) During transmission, the operator's circuit is inductively coupled to the trunk through repeating coil 72EA. Ground for the operator's transmission battery is provided through switch contacts 4R–5R.

(5) When the HOLD-TALK-NORMAL switch is operated to the HOLD position, the operator's circuit is disconnected from the trunk and a 50-ohm bridge (resistor 7) is placed across the T and R of the trunk to hold the central office equipment. This frees the operator to answer an emergency reporting line call while holding the trunk call. Operation of the switch to the TALK position reconnects the operator's circuit to the trunk.

b. Outgoing Call.

(1) Operation of the HOLD-TALK-NORMAL switch of an idle trunk to the TALK position places the 30 ohms resistance of retardation coil 8ED in the operator's circuit across the T and R of the trunk and operates an incoming signal at the post switchboard or seizes equipment which provides dial tone if the trunk terminates in a dial office.

(2) Relay 5 does not operate and the trunk supervisory lamp does not light on outgoing calls.

54. Operator's Circuit

(fig. 20)

a. Transmitting.

(1) To prevent unnecessary drain on the battery when no calls are in progress, the transmission battery circuits are held open at make contacts of the trunk and cord circuit switches. Operation of any switch to the TALK position completes the transmission battery circuit through the primary windings of induction coil 72EA, the transmitter, and retardation coil 8EC.

(2) The transmitter resistance varies as the operator speaks, causing voice currents to flow through the transmitter, the primary windings of the induction coil, and the parallel-connected capacitors 3. Retardation coil 8EC keeps the voice currents out of the battery.

(3) Voice currents in the primary of the induction coil induce a voltage in the secondary which causes voice currents to flow to the cord or trunk circuit. High impedance coil 8ED prevents the voice currents from being shorted across the T and R leads.

b. Receiving.

(1) Voice currents through the circuit described in *a*(3) above from a cord or trunk circuit also flow through the R–L winding of the induction coil, dc blocking capacitor 4, and the operator's receiver.

(2) The varistor across the receiver has a high resistance to low voltage and a low resistance to high voltage. This device prevents acoustic shock (loud clicks) from reaching the receiver by shunting the surges of high voltage.

c. Dialing.

(1) When the dial is turned off normal (on an outgoing call to a dial office (par. 53*b*)), the shunt springs of the dial complete the circuit for relay 2 which operates.

(2) Contacts 1R–3R close a low resistance dialing path through the impulse springs before 2R–3R break. This prevents sending a false preliminary pulse to the dial exchange equipment.

(3) Contacts 1L–2L open the circuit to the secondary of repeating coil 72EA and impedance coil 8ED.

(4) Contacts 5L–6L complete the circuit to relay 1 which operates.

(5) Relay 1 further opens the circuit to the operator's receiver to prevent dial clicks from being heard as the dial restores to normal.

(6) Each time the dial restores to normal, the shunt springs open and release relays 2 and 1. This reconnects the operator's circuit to the trunk.

55. Power Failure Circuit

(fig. 20)

This circuit provides an indication of a failure in the dc power supply or a discharged condition of the battery.

a. If the battery voltage drops below the minimum operating voltage requirements (par. 4), relay 16 will release and cause the ac powered buzzer to sound. The POWER FAILURE LAMP (normally lighted) will go out.

b. When the battery voltage is raised, relay 16 will operate and open the circuit to the buzzer and the POWER FAILURE LAMP will light.

56. Ringing Circuit

(fig. 20)

This circuit provides 20 cps, 70 to 90 volts ac to the cord circuit ringing switches. It includes a hand generator and a selecting switch for use during automatic ringing failure.

a. Automatic Ringing.

(1) When a cord circuit switch is operated to the RING position, ringing current is extended through a generator resistance lamp, contacts of the RINGING TRANSFER KEY in the POWER GEN. position, and contacts of the cord switch to the cord. The generator lamp protects the ringer against an overload.

(2) Cord switch contacts 3R–4R complete a parallel circuit through the RINGING LAMP (V1), which lights while ringing current is being applied to a line. Resistors 14 and 15 are current limiting to plate and grid respectively.

b. Hand Generator Ringing. When the RINGING TRANSFER KEY is operated to the HAND GEN. position, the circuit is transferred from the automatic ringing source to the hand generator. The hand generator handle must be cranked to provide the ringing current.

CHAPTER 6
FIELD AND DEPOT MAINTENANCE

57. General

Troubleshooting at field and depot maintenance levels includes all of the techniques covered in organizational maintenance (pars. 28–49) and the final testing procedures given in paragraphs 59 through 64. The tests outlined in this chapter measure the performance capability of a repaired equipment.

58. Tools and Test Equipment

a. Tools. The tools required for field and depot maintenance are the same as those listed for organizational maintenance (pars. 33 and 34).

b. Test Equipment. In addition to the test equipment listed in paragraph 33, the test equipment listed below is required to final test the SB–55(*)/FTC.

Test equipment	*Reference*
Test Set TS–140/PCM	TM 11–2096
Telephone Test Set AN/PTM–6 or Test Set I–142, I–142–A, or I–142–B.	TM 11–2062

59. Power Distribution

a. Continuity. Check the fuse panel (fig. 7) for grounds before connecting any power to the switchboard. With all fuses removed, connect the ohmmeter or a buzzer between the battery bus and the ground bus, and then between the ground bus and the fuse terminals. If the battery bus or any fuse terminal is grounded, the test equipment will indicate the condition.

(1) To locate the ground, disconnect the battery distribution leads one at a time until the grounded lead is discovered.

(2) Check the circuit assignment (fig. 7) to determine which circuits are supplied through this lead.

(3) Split the circuits at midpoint and check for the ground on the side where the ground still appears.

Example. If the lead serves line circuits 1 through 10, open the lead between circuits 5 and 6 by insulating relay contacts or by unsoldering. This narrows the search to five circuits.

(4) Examine for shorted terminals, broken wire resting against frame, frayed insulation, wire clipping, or loose drop of solder. A defective component may require repeated splitting procedure to narrow the search to one circuit to reveal the source of trouble.

b. Voltage Application.

(1) When the battery bus and fuse terminals are not grounded, connect a 48-volt source to the BAT. + and − terminals in the rear of the switchboard (fig. 5). Relay 16 should operate and the POWER FAILURE LAMP should light.

(2) Connect a source of ringing current to the terminals marked GEN ± and G.

(3) Insulate contacts 1 and 2 of all LO relays to prevent the line-out alarm from sounding as the circuits are fused.

(4) Insert the fuses. As each fuse is inserted, refer to the schematic diagram (fig. 20) and the circuit assignment list (fig. 7). Use the test receiver and check for a battery potential at the points indicated on the drawing in the circuits supplied through the fuse.

60. Line Circuits

A modified Telephone TA–105/FTC (par. 7*b*) equipped with alligator clips is required to simulate line conditions for testing the line circuits. Refer to the schematic drawing (fig. 20) when making these tests.

a. Connect the test telephone to the T and R leads of circuit 1 on the line terminal board and note that relay LO of that circuit operates.

b. Connect the test receiver to the + terminal and check for absence of battery on terminal A of the line circuit and terminal REL on the miscellaneous terminal board (no click should be heard).

c. Lift the handset from the cradle of the test telephone.

(1) Relays ER and A in the line circuit should operate and the line lamp should light.

(2) One relay 10 should operate in the night alarm circuit and the night alarm bell should ring. Insulate contacts 2 and 3 of both relays 10 to silence the bell while testing the rest of the line circuits.

d. Check for battery on terminal A and the REL terminal (a click should be heard).

e. Insert a cord plug into the line jack.

(1) Relays P and S in the cord circuit should operate.

(2) Relays ER, LO, and 10 should release and the line lamp should go out.

(3) If an annunciator release switch has been installed in the face equipment (par. 14), it is necessary to operate the switch to release relay A.

f. Operate the cord circuit switch to the TALK position and check transmission from the operator's handset to the test telephone.

g. Replace the handset of the test telephone. Relay S in the cord circuit should operate and the cord supervisory lamp should light.

(1) Operate the cord circuit switch to the RING position.

(2) The RINGING LAMP should light and the test telephone bell should ring.

h. Remove the insulator from the contacts of relay LO and disconnect the test telephone.

(1) Relay P in the cord circuit should release.

(2) The line-out lamp in the cord circuit should light.

i. Remove the cord plug from the jack.

(1) The cord circuit lamps should go out.

(2) The line circuit line-out lamp should light, one relay 13 should operate, and the buzzer should sound.

(3) Operate the BUZZER CUT OFF KEY to the OFF position to silence the buzzer while testing the rest of the line circuits.

(4) Replace the insulator between contacts 1 and 2 of relay LO.

j. Repeat the procedure in *a* through *i* above, to test each of the line circuits. Use the three cords during the test. Use the hand generator to signal the test telephone on at least one line circuit.

61. Trunk Circuits

a. Connect the test telephone to terminals T2 and R2 on the miscellaneous terminal board and remove the handset from the cradle.

b. With the trunk circuit switch of trunk No. 2 in the NORMAL position, momentarily connect ringing current to the T2 and R2 terminals.

(1) Relay 5 should operate from the ringing current and lock over its dc path.

(2) The trunk supervisory lamp should light, relay 10 should operate, and the night alarm bell should ring.

c. Operate the trunk circuit switch to the TALK position and check transmission from the operator's handset to the test telephone.

d. Operate the trunk circuit switch to the HOLD position and repeat the procedure in *a* through *c* above, on trunk circuit No. 1, using the T1 and R1 terminals.

e. When the trunk testing is completed, leave the switches of both trunks in the HOLD position and connect the test telephone to the T and R terminals of a line circuit.

(1) Insert a cord plug into the jack of the line circuit and operate the cord circuit switch to the TALK position.

(2) Normal transmission should be possible from the operator's handset to the test telephone with one or both trunk circuit switches in the HOLD position.

62. Miscellaneous Circuits

The testing of the power and alarm circuits has been covered as it applies to the lines, trunks, and cords in paragraphs 59 through 61. No further testing of these supplementary circuits is required.

63. Transmission Loss Tests

Perform transmission loss tests on line, cord, and trunk circuits. Refer to TM 11–2096 for instructions covering these tests.

64. Operator's Telephone Circuit Tests

a. Operational Test.

(1) Connect the test telephone to the T1 and R1 terminals on the miscellaneous terminal board and remove the handset.

(2) Operate the switch of trunk circuit No. 1 to the TALK position.

(3) Turn the dial off normal.

(*a*) Relays 1 and 2 should operate.

(*b*) Sidetone should be lost in the operator's receiver.

(4) Release the dial.

(*a*) As the dial restores, no clicks should be heard in the operator's receiver.

(*b*) The dial clicks should be heard in the test telephone.

b. Efficiency Tests (Operator's Handset). Perform efficiency tests on the transmitter and receiver of the operator's telephone circuit. Refer to TM 11–2062 for instructions covering these tests.

CHAPTER 7
SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

65. Disassembly of Equipment
(fig. 5)

The following instructions are recommended as a guide for preparing Telephone Switchboard SB–55(*)/FTC for shipment and storage:

a. Disconnect the ringing and battery leads.

b. Disconnect the line trunk and annunciator cables.

c. Disconnect the BX cable from the heater junction box (SB–55A/FTC only).

d. Disconnect the four handset leads from the rear of the piling rail and pull the handset cord through the hole to the front of the switchboard.

e. Tie the cords to the metal frame with twine.

66. Repacking for Shipment and Limited Storage

The exact procedure for repacking depends on the material available and the conditions under which the equipment is to be shipped or stored. Adapt the procedures outlined below whenever possible. The information concerning the original packaging (par. 10) will also be helpful.

a. Materials Required. The following materials are required for packaging Telephone Switchboard SB–55(*)/FTC. For stock numbers of materials consult SB 38–100.

(1) *Packaging material.*

Material	Quantity
Cotton twine	20 ft
Gummed paper tape	60 ft
Adhesive waterproof tape	100 ft
Waterproof paper (barrier material)	90 sq ft
Single-face corrugated fiberboard	60 sq ft
Double-face corrugated fiberboard	125 sq ft
Filler material	18 lb
Steel strapping	80 ft
4″ x ½″ bolts	6
½″ hex nuts	6
½″ flat washers	12
½″ lockwashers	6

(2) *Wooden shipping container.*

Box size (in.)	Board feet of lumber required	Cubic feet	Packed weight (lb)
30 x 42 x 66	68	40	825

b. Packaging.

(1) Wrap the boxes that contain the spare lamps and fuses in single-face corrugated fiberboard and secure with gummed paper tape.

(2) Place the special tools (par. 34) in the canvas bag and secure the bag with gummed paper tape.

(3) Cushion the handset and cord in a pad of filler material and wrap them in single-face corrugated fiberboard; secure with gummed paper tape.

(4) Consolidate these packages and the technical manuals into one package wrapped in waterproof paper and seal with waterproof tape.

(5) Secure the consolidated package within the switchboard; use waterproof tape to fasten it to the metal framework.

(6) After securing the consolidated package, close the relay gate and secure it with the four corner bolts.

(7) Replace the rear cover and secure it with the captive screws.

(8) Make two blocking assemblies of double-face fiberboard to square up the front of the switchboard. Cushion the edges that meet the switchboard and fasten the blocking assemblies in position with gummed paper tape.

(9) Enclose the entire switchboard in double-face corrugated fiberboard (sleeve and end caps). Seal all closures with waterproof tape.

c. Packing (fig. 3).

(1) Build a wooden pallet and strap the switchboard to it. Cushion all edges to prevent the steel straps from cutting through the protective material.

(2) Drill boltholes through the pallet.

(3) Build a wooden shipping container. Drill and assemble the components as indicated in figure 3. Line it with waterproof paper.

(4) Place the pallet mounted switchboard in the container.

(5) Fasten the bolts through the box to the pallet. Be sure to arrange washers and bottom filler in proper sequence.

(6) Seal the waterproof paper with waterproof tape.

(7) Nail the top on the container and fasten it with steel strapping.

Section II. DEMOLITION OF EQUIPMENT TO PREVENT ENEMY USE

67. Authority for Demolition

Demolition of the equipment will be accomplished only upon the order of the commander. The destruction procedures outlined in paragraph 68 will be used to prevent further use of the equipment.

68. Methods of Destruction

Use any or all of the following methods to destroy the equipment:

a. Smash. Smash the controls, tubes, coils, relays, switches, capacitors, and resistors; use sledges, axes, handaxes, pickaxes, hammers, or crowbars.

b. Cut. Cut all cables and cords and slash the wiring on the rear of the switchboard; use axes, handaxes, or machetes.

c. Burn. Burn cords and technical manuals; use gasoline, kerosene, oil, flamethrowers, or incendiary grenades.

d. Bend. Bend panels and framework.

e. Explode. If explosives are necessary, use firearms, grenades, or TNT.

f. Dispose. Bury or scatter the destroyed parts.

APPENDIX
REFERENCES

Following is a list of references applicable and available to the field and depot repairman of Telephone Switchboard SB–55/FTC and SB–55A/FTC.

TM 11–468	Substation Maintenance.
TM 11–487B	Directory of Signal Corps Equipments, Wire Communication Equipment.
TM 11–900	Power Units PE–75–C, –D, –J, –K, –P, –S, –T, –V, –W, –AA, –AB, –AC, and –AE.
TM 11–900A	Power Unit PE–75–AF.
TM 11–2036	Test Set I–181, I–181–A, and I–181–B.
TM 11–2062	Test Sets I–142, I–142–A, I–142–B, and Telephone Test Set AN/PTM–6.
TM 11–2096	Test Sets TS–140/PCM, Signal Generator SG–15/PCM and Decibel Meter ME–22/PCM.
TM 11–2536	Rectifier Battery Charger PP–255A/FT.
TM 9–2857	Storage Batteries, Lead-acid type.
TB SIG 218	Instructions for Installation, Operation, and Maintenance of Annunciator ID–214/FT.

INDEX

	Paragraph	Page
Additional equipment required	7	5
Installation	15	10
Adjustments and requirements:		
Lever type switches	41	26
Turn button switches	42	27
Annunciator:		
Circuit, connections	19	11
Release switch, connections	20	11
Release switch, installation	14	6
Authority, demolition	67	41
Batteries:		
Description	7	5
Installation	15	10
Characteristics, technical	4	3
Chart, troubleshooting	39	24
Checking unpacked equipment	11	6
Checklist, switchboard operator's	31	18
Components	5	4
Connections:		
Annunciator circuit	19	11
Annunciator release switch	20	11
48-volt battery circuit	17	10
Heater circuit	21	11
Line and trunk circuits	18	10
Ringer circuit	16	10
Controls	25	14
Cord circuit, theory	52	34
Demolition authority	67	41
Description:		
Annunciator ID–214/FT	7	5
Battery BB–232/FTC	7	5
Distributor Frame TA–47/FT	7	5
Rectifier Battery Charger PP–255A/FTC	7	5
Ringer TA–48/FT	7	5
Telephone Switchboard SB–55(*)/FTC	6	4
Telephone TA–105/FTC (modified)	7	5
Destruction, methods	68	41
Differences in models	8	5
Disassembly, equipment	65	40
Equipment:		
Checking unpacked	11	6
Disassembly	65	40
Required, additional	7	5
Final testing:		
Lines and cords	60	37
Miscellaneous circuits	62	38
Operator's telephone circuit	64	38
Power distribution	59	37
Trunk circuits	61	38
Forms and records	2	3
48-volt battery circuit connections	17	10
Fuses, installation	13	6
Gate-mounted components, removal and replacement	47	30

	Paragraph	Page
Heater circuit, connections	21	11
Identification, relay	43	27
Inspection, visual	37	23
Installation:		
Additional equipment	15	10
Annunciator release switch	14	6
Fuses	13	6
Lamps	13	6
Switchboard	12	6
Jack and lamp strip, removal and replacement	48	30
Keyshelf components, removal and replacement	49	30
Lamps, installation	13	6
Lever-type switches, requirements and adjustments	41	26
Line and trunk circuit, connections	18	10
Line circuit, theory	51	33
Line-out alarm test	30	18
Lines and cords, final testing	60	37
Localizing troubles	38	23
Methods of destruction	68	41
Miscellaneous circuits, final testing	62	38
Models, differences	8	5
Operating procedure	26	14
Operation, unusual conditions	27	17
Operator's telephone circuit:		
Final testing	64	38
Theory	54	35
Organizational maintenance:		
Preventive maintenance	35	20
Scope	32	20
Tools, materials, and test equipment	33	20
Outside lines, test	24	12
Power distribution, final testing	59	37
Power failure circuit, theory	55	36
Preoperational tests	23	12
Preventive maintenance:		
Organizational	35	20
Switchboard operator's	29	18
Procedure:		
General troubleshooting	36	23
Operating	26	14
Purpose and use	3	3
Records, forms and	2	3
Relays:		
Identification	43	27
2000 type	44	27
2100 type	45	28
Removal and replacement:		
Gate-mounted components	47	30
Jack and lamp strips	48	30
Keyshelf components	49	30
Repacking for shipment and limited storage	66	40
Requirements and adjustments:		
Lever-type switches	41	26
Relays	44	27
Turn button switches	42	27
Ringer circuit:		
Connections	16	10
Theory	56	36

	Paragraph	Page
Scope	1	3
Shipment and limited storage, repacking	66	40
Siting	9	6
Special tools	34	20
Switchboard, installing	12	6
Switchboard operator's:		
Checklist	31	18
Preventive maintenance	29	18
Technical characteristics	4	3
Telephone Switchboard SN–55(*)/FTC, description	6	4
Tests:		
Line-out alarm	30	18
Outside lines	24	12
Preoperational	23	12
Transmission loss	63	38
Theory:		
Cord circuit	52	34
Line circuit	51	33
Operator's circuit	54	35
Power failure circuit	55	36
Ringing circuit	56	36
Trunk circuit	53	34
Tools and test equipment:		
Depot maintenance	58	37
Organizational maintenance	33	20
Tools, special	34	20
Troubleshooting:		
Chart	39	24
Localizing	38	23
Procedures, general	36	23
Trunk and line circuit, connections	18	10
Trunk circuit:		
Final testing	61	38
Theory	53	34
Turn button switches, adjustments and requirements	42	27
Type 2000 relays	44	27
Type 2100 relays	45	28
Unpacking	10	6
Unusual conditions, operating	27	17
Use, purpose	3	3
Visual inspection	37	23

[AG 412.42 (28 Feb 58)]

BY ORDER OF THE SECRETARIES OF THE ARMY AND THE AIR FORCE:

MAXWELL D. TAYLOR,
General, United States Army,
Chief of Staff.

OFFICIAL:
HERBERT M. JONES,
Major General, United States Army,
The Adjutant General.

THOMAS D. WHITE,
Chief of Staff, United States Air Force.

OFFICIAL:
J. L. TARR,
Colonel, United States Air Force,
Director of Administrative Services.

DISTRIBUTION:

Active Army:

ASA
CNGB
Technical Stf, DA
Technical Stf Bd
USA Arty Bd
USA Armor Bd
USA Inf Bd
USA Air Def Bd
USA Abn & Elct Bd
USA Avn Bd
USA Armor Bd Test Sec
USA Air Def Bd Test Sec
USA Arctic Test Bd
USCONARC
US ARADCOM
OS Maj Comd
Log Comd
MDW
Armies
Corps
Div
USATC
Ft & Camp
Svc Colleges
Br Svc Sch
Gen Depots
Sig Sec, Gen Depots
Sig Depots
Fld Comd, AFSWP
Engr Maint Cen
Army Pictorial Cen
WRAMC
AFIP
AMS
Port of Emb (OS)
Trans Terminal Comd
Army Terminals
OS Sup Agcy
USA Sig Pub Agcy
USA Sig Comm Engr Agcy
USA Comm Agcy
TASSA
USA Sig Eqp Spt Agcy
USA White Sands Sig Agcy
Yuma Test Sta
USA Elct PG
Sig Fld Maint Shops
Sig Lab
Mil Dist
JBUSMC
Units org under fol TOE:

11–7	11–500 (AA–AE)
11–16	11–557
11–57	11–587
11–127	11–592
11–128	11–597

NG: State AG; units—same as Active Army.
USAR: None.
For explanation of abbreviations used, see AR 320–50.

☆ U. S. Government Printing Office: 1958—440509